

DOCKET NO: 254659US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
VOLKER HENNIGE, ET AL. : EXAMINER: COLE, ELIZABETH M.  
SERIAL NO: 10/501,713 :  
FILED: JULY 19, 2004 : GROUP ART UNIT: 1782  
FOR: CERAMIC MEMBRANE BASED :  
ON A SUBSTRATE CONTAINING  
POLYMER OR NATURAL FIBRES,  
METHOD FOR THE PRODUCTION AND  
USE THEREOF

APPEAL BRIEF UNDER 37 C.F.R. § 41.37

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

Responsive to the Final Office Action of April 16, 2010 and the Advisory Action of July 21, 2010, Appellants request the Board of Patent Appeals and Interferences reverse the rejections in the present application.

I. REAL PARTY IN INTEREST

The real party in interest is Evonik Degussa GmbH.

## II. RELATED APPEALS AND INTERFERENCES

11/578,664 - Appeal Brief filed August 21, 2009, Examiner's Answer mailed November 30, 2009. Awaiting decision by the Board of Appeals.

10/524,665 – REVERSED

10/524,143 - REVERSED

## III. STATUS OF THE CLAIMS

Claims 1, 3-5, 7-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are pending in the present application. All of the pending claims stand rejected. The rejection of all of the pending claims is appealed.

## IV. STATUS OF THE AMENDMENTS

The Amendment filed on January 21, 2010 was entered and considered. The Request for Reconsideration filed on July 7, 2010 was entered and considered.

## V. SUMMARY OF THE CLAIMED SUBJECT MATTER

Claim 1 is an independent claim drawn to a membrane. The membrane is described on page 1, lines 4-8. The membrane includes a sheetlike flexible substrate having openings and a porous coating. The openings and porosity are described on page 3, lines 29-38; page 4, lines 1-10; page 6, lines 1-22; page 8, lines 33-36; page 9, lines 1-12; and page 10, lines 10-15. The porous coating is on and in the substrate and comprises an adhesion promoter and one or more inorganic components. The inorganic component is described in page 8, lines 16-31. The adhesion promoter is described on page 8, lines 8-14; and page 15, line 15

through page 16, line 31. The substrate is made of a non-woven polymeric fiber. The fiber is described on page 10, lines 17-35; page 9, lines 1-12; and page 7, lines 20-24.

Claim 53 is an independent claim likewise drawn to a membrane. The particular adhesion promoter-containing composition recited in Claim 53 is described on page 21, line 27 through page 25, line 36.

Claim 3 recites non-woven fibers disclosed on page 6, line 35 - page 7, line 18.

Claim 4 recites a porosity described on page 6, lines 1-22. Claim 5 describes a coating containing particular metals described on page 7, lines 26-30.

Claim 7 recites a membrane having an average pore size described on page 9, lines 1-12.

Claim 8 recites a membrane having a particular tensile strength described on page 9, lines 14-24.

Claim 9 recites a membrane having a particular bendable radius described on page 9, lines 14-24.

Claim 10 recites a membrane having a particular bendable radius described on page 9, lines 14-24.

Claim 11 recites a process for making the membrane of Claim 1. Steps including applying are described on page 9, line 26 through page 10, line 3.

Claim 12 recites a process that includes particular types of applying described on page 10, lines 5-8.

Claim 14 recites a process that includes making a metal oxide sol described on page 11, lines 1-7.

Claim 15 recites a sol obtained by the hydrolyzing described on page 11, lines 11-25.

Claim 16 recites a process that uses a particular sol described on page 12, line 12 through page 13, line 4.

Claim 17 recites a process that includes using a sol of particular composition described on page 11, lines 11-25.

Claim 18 recites a process in which a sol includes a particular element described on page 11, lines 11-25.

Claim 19 recites a process that includes using a sol having a particular suspended component described on page 14, line 29 through page 15, line 2.

Claim 20 recites a process that includes adding an adhesion promoter described on page 14, lines 17-27.

Claim 22 recites a process of using a particular adhesion promoter described on page 15, lines 22 through page 16, line 31.

Claim 24 recites a process of heating a suspension at temperatures described on page 16, lines 1-31.

Claim 25 recites a process of heating a suspension at temperatures described on page 16, lines 1-31.

Claim 26 is drawn to a method for making a battery described in original Claim 26.

Claim 27 is drawn to a method of using a membrane described in original Claim 27.

Claim 28 is drawn to a method for microfiltration described in original Claim 28.

Claim 30 recites a process described on page 12, line 12 through page 13, line 4.

Claim 31 recites an adhesion promoter of particular composition described on page 11, lines 11-25.

Claim 32 recites a particular polymeric fiber disclosed on page 6, line 35 through page 7, line 18.

Claim 33 recites a particular polymeric fiber disclosed on page 6, line 35 through page 7, line 18.

Claim 38 recites a particular polymeric fiber disclosed on page 6, line 35 through page 7, line 18.

Claim 40 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 46 recites a particular polymeric fiber disclosed on page 6, line 35 through page 7, line 18.

Claim 47 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 48 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 49 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 50 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 51 recites an adhesion promoter disclosed on page 15, line 15 through page 16, line 31.

Claim 53 is an independent claim drawn to a membrane. The membrane is described on page 1, lines 4-8. The membrane includes a sheetlike flexible substrate having openings and a porous coating. The openings and porosity are described on page 3, lines 29-38; page 4, lines 1-10; page 6, lines 1-22; page 8, lines 33-36; page 9, lines 1-12; and page 10, lines 10-15. The porous coating is on and in the substrate and comprises an adhesion promoter and one or more inorganic components. The inorganic component is described in page 8, lines

16-31. The adhesion promoter is described on page 8, lines 8-14; and page 15, line 15 through page 16, line 31. The substrate is made of a non-woven polymeric fiber. The fiber is described on page 10, lines 17-35; page 9, lines 1-12; and page 7, lines 20-24. The particular adhesion promoter-containing composition recited in Claim 53 is described on page 21, line 27 through page 25, line 36.

Claim 54 recites non-woven fibers disclosed on page 6, line 35 - page 7, line 18.

Claim 55 recites a membrane having an average pore size described on page 9, lines 1-12.

Claim 56 recites a membrane having a particular bendable radius described on page 9, lines 14-24.

Claim 57 recites a membrane having a particular bendable radius described on page 9, lines 14-24.

Claim 58 recites an adhesion promoter-containing composition described on page 21, line 27 through page 25, line 36.

Claim 59 recites a process for making the membrane of Claim 53. Steps including applying are described on page 9, line 26 through page 10, line 3.

## VI. GROUND OF REJECTION

(A) Claims 1, 3-5, 7-12, 14-22, 24-28, 30-31, 33, 40, 46-51, 53-59 are rejected as obvious under the meaning 35 U.S.C. § 103(a) over Penth (U.S. 6,309,545) in combination with Bishop (U.S. 5,639,555).

(B) Claims 32, 34-38 and 49 are rejected as obvious under the meaning 35 U.S.C. § 103(a) over Penth in combination with Bishop and Sassa (U.S. 5,324,579).

(C) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting over Claims 1-36 of co-pending application 10/504,144 in combination with Penth and Bishop.

(D) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting over Claims 1-25 of co-pending 10/524,143 in combination with Penth and Bishop.

(E) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting in view of Claims 1-25 of co-pending 10/524,669 in combination with Penth and Bishop.

(F) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting over Claims 1-24 of co-pending 10/519,097 in combination with Penth and Bishop.

(G) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting over Claims 1-29 of co-pending 10/575,268 in combination with Penth and Bishop.

(H) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are provisionally rejected for non-statutory obviousness-type double patenting over Claims 1-24 of co-pending 10/575,759 in combination with Penth and Bishop.

(I) Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 are rejected for non-statutory obviousness-type double patenting over Claims 22-42 of co-pending 10/575,734 in combination with Penth and Bishop.

## VII. ARGUMENT

**(A-1) The rejection of the claims as obvious over the Penth and Bishop references should be withdrawn because the cited art fails to describe or suggest a non-woven polymeric fiber substrate having a porosity of more than 50%.**

The membranes of Claims 1 and 53 include a substrate that is in the form of a non-woven polymeric fiber. The material of the substrate must have “a porosity of more than 50%” and a thickness of 10-200  $\mu\text{m}$ .

The Examiner has taken the position that fiber size is related to pore size and porosity and thus it would be obvious to control the porosity of any prior art substrates to meet the requirements of the present claims (see paragraph No. 18 on pages 14-16 of the April 16, 2010 Office Action). The Examiner cited to column 9, lines 35-48 of Penth as support for this assertion. Appellants submit that nothing in the cited disclosure relates fiber size to pore size or porosity and thus the Examiner’s rejection of the claims is factually not supportable.

Appellants submitted factual evidence on January 21, 2010 (see the Evidence Appendix) showing how pore size relates to hole size and how hole size relates to porosity. The evidence shows that the materials described in the Penth reference have a porosity that is nowhere near the “more than 50%” porosity recited in the present claims.

Penth describes a material having a mesh size of 90  $\mu\text{m}$  and a pore width of 0.2-0.4  $\mu\text{m}$  (see Example 2.1 of Penth at column 12, lines 28-35). The evidence of record shows that a mesh having a mesh size of 90  $\mu\text{m}$  corresponds to a standard 170 mesh size on the Tyler



scale (see Appellants' remarks on pages 12-13 of the January 21, 2010 Amendment). A 170 mesh on the Tyler scale corresponds with a sieve having pore openings of a maximum width of 0.4  $\mu\text{m}$  occurring at a frequency of 170 sieve holes per linear inch. As explained in the January 21, 2010 Amendment, this corresponds with a porosity of 0.3%.

The above-calculated porosity shows that the Penth substrate is substantially different with respect to the porosity recited in the present claims. The porosity as calculated above would have to be increased by a factor of over 100 in order to be anywhere near the porosity recited in the present claims.

Appellants submit that the porosity of the Penth materials is in an entirely different realm than the porosity of the present claims and the Penth porosity is not suggestive of nor optimizable in a manner to provide a porosity of more than 50%. Appellants thus submit that the cited art fails to disclose or suggest the requirement of the present claims that the material of the substrate have a porosity of 50% or more.

Appellants thus submit that reversal of the Examiner's rejections is appropriate.

**(A-2). The cited art does not suggest that a glycidylloxy- or methacryloyloxy-functionalized silanes are equivalent to the coupling agents taught in the Penth patent and thus the basis for the Examiner's combination of Penth and Bishop is insufficient to sustain the rejection.**

Both of Claims 1 and 53 recite an adhesion promoter that includes "at least one of a glycidylloxy-functionalized silane and methacryloyloxy-functionalized silane". The Examiner concedes that the Penth reference does not teach the particular adhesion promoters noted above. The Examiner nonetheless asserts that it would be obvious to use these adhesion promoters in view of Bishop's disclosure that glycidylloxy- and methacryloyloxy-

functionalized silanes are equivalent to the silanes “claimed by Penth” (see page 11, line 17 through page 12, line 6 of the April 16, 2010 Office Action).

Appellants submit that the Examiner’s characterization of the Bishop patent with respect to teachings allegedly proving that those of skill in the art would believe that the Bishop coupling agents are equivalent to the Penth silanes is not correct as a matter of fact. Bishop discloses the use of glycidyoxy- and acryloyloxy-functionalized silanes only insofar as they are used in combination with a tris(silylorgano) amine-containing composition (see column 1, lines 65-66 of Bishop, i.e., the Bishop compositions must contain both a silane coupling agent and a tris(silylorgano)amine.

Bishop does not disclose that glycidyoxy- and/or methacryloyloxy-functionalized adhesion promoters or silanes are generically equivalent to any silane coupling agent in the absence of a tris(silylorgano)amine. Those of skill in the art reading the Bishop disclosure, are thus taught that glycidyoxy-functionalized and/or methacryloyloxy-functionalized adhesion promoters are to be used in combination with a tris(silylorgano)amine.

Bishop distinguishes compositions which contain only a silane coupling agent, e.g., a glycidyoxy- and/or methacryloyloxy-functionalized silane, from compositions which contain both a functionalized silane and a tris(silylorgano)amine. Bishop points out that bonds formed by silane coupling agents are deleteriously affected by moisture and specifically identifies compositions which include a combination of a silane coupling agent and a tris(silylorgano) amine as an improvement thereover (see column 1 of the Bishop patent). Appellants thus submit that the Examiner’s assertion that Bishop discloses that glycidyoxy- and methacryloyloxy-functionalized silanes are equivalent to silane coupling agents is not correct.

The Examiner takes contradictory positions with respect to the Bishop and Penth disclosures. The Examiner states that the Bishop patent was “not relied on for the particular use of a the silane coupling agents” (see page 14, lines 8-9 of the April 16, 2010 Office Action) while concurrently taking the position that the Bishop materials are generically equivalent to the silane coupling agents of Penth. In this respect the Examiner’s position is contradictory. On the one hand the Examiner interprets Bishop’s disclosure narrowly, that is, that the disclosure’s particular glycidyoxy- and methacryloyloxy-functionalized silanes is conventional. On the other hand the Examiner ignores Bishop’s broad disclosure that such functionalized silanes must be used in combination with a tris(silylorgano)amine. The Examiner applies the teachings of Bishop selectively to ignore or disregard the contradictory disclosure in Bishop that ties glycidyoxy- and methacryloyloxy-functionalized silanes to particular tris(silylorgano)amines.

Appellants thus respectfully request withdrawal of the rejection for the reason that the Examiner considers the cited art narrowly for the purposes of obviousness and to ignore the contradictory disclosure of the reference as a whole.

**(A-3). The cited art does not suggest the particular composition of Claim 53 which excludes the compositions of at least the Bishop reference.**

This argument (A-2) above is especially relevant to the rejection of Claim 53 which recites a particular adhesion promoter-containing composition that “is a reaction product of a mixture that consists of water, HCl, ethanol, tetraethoxysilane, methyltrimethoxysilane and at least one of a glycidyoxy-functionalized silane and a methacryloyloxy-functionalized silane.”

The adhesion promoter-containing composition of Claim 53 excludes the adhesion promoter of the Bishop reference. As explained above, Bishop describes the use of

glycidylloxy- and methacryloyloxy-functionalized silanes only insofar as they are combined with a tris(silylorgano)amine. Claim 53 necessarily excludes the Bishop compositions because the promoter-containing composition must be derived from a mixture that excludes the tris(silylorgano)amine of the Bishop reference.

In this respect, the Examiner's interpretation of Bishop in a contradictory narrow/broad manner is incompatible with the exclusion of the Bishop compositions from Claim 53.

Appellants thus submit that the rejection of Claim 53 should further be reversed.

The obviousness-type double patenting rejections should be withdrawn because the rejections rely on an improper combination of Penth and Bishop.

For the reasons explained above in detail, Appellants respectfully request reversal of the rejections.

**(B) The Sassa reference does not disclose that the particular polymeric materials described in Claims 32, 34-38 and 49 are interchangeable in the inorganic component - and adhesion promoter - containing coating of the present claims and thus Sassa in combination with Bishop and Penth does not support a *prima facie* case of obviousness for the rejected claims.**

The Examiner cited to column 5, line 56 through column 6, line 56 as evidence that certain synthetic plastic fibers are interchangeable with polyamide fibers (see paragraph no. 16 on pages 13 and 14 of the April 16, 2010 Office Action). The Examiner's assertion does not take into account the fact that the synthetic fibers described in the Sassa compositions are present only as an additive to a PTFE fiber which has been rendered electrically conductive. Sassa suggests no more than the inclusion of naked synthetic fibers as an additive to coated PTFE fibers. The PTFE/synthetic fiber mixture of Sassa does include a synthetic fiber that is coated with a porous ceramic coating such as that recited in the present claims. This is

insufficient evidence from which to draw the conclusion that the prior art suggests that any of the fibers recited in rejected Claims 32, 34-38 and 49 are interchangeable with the materials described in the Penth reference.

The rejection fails to link the naked fibers of the Sassa reference with the coated fibers of the present claims and/or those fibers which are allegedly disclosed or suggested in the Penth reference. Just because certain fibers may be suitable for inclusion in uncoated fiber mixtures does not mean that such fibers are suitable for coating with a ceramic coating.

Appellants thus respectfully request the Board reverse the Examiner's rejection of the claims in view of Penth in combination with Bishop and Sassa.

**(C)-(I) The rejection of Claims 1, 3-12, 14-22, 24-28, 30-38, 40, 46-51 and 53-59 for non-statutory obviousness-type double patenting should be withdrawn because the Examiner's reliance on a combination of Penth and Bishop is legally unsupportable.**

As explained above in the argument (A-1) and (A-2) the combination of Penth and Bishop is not a sufficient basis for setting forth a prima facie case of obviousness. Because each of the obviousness-type double patenting rejections relies on the improper combination of the Penth and Bishop references, the rejections should be reversed.

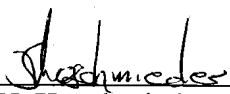
For the reason discussed in detail above, Appellants submit that REVERSAL of the rejections is appropriate.

Respectfully submitted,

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## VIII. CLAIMS APPENDIX

Claim 1 (Previously Presented): A membrane, comprising:

a sheetlike flexible substrate having a multiplicity of openings and having a porous coating on and in said substrate, said coating comprising an adhesion promoter and one or more inorganic components,

wherein the material of said substrate is a nonwoven polymeric fiber selected from the group consisting of a poly-acrylonitrile fiber, a polyamide fiber, a polyimide fiber, a poly-acrylate fiber, a polytetrafluoroethylene fiber, a polyester fiber, a polyolefin fiber and mixtures thereof, said material having a porosity of more than 50%, said substrate being from 10 to 200  $\mu\text{m}$  in thickness and said coating being a porous ceramic coating,

wherein the adhesion promoter is at least one of a glycidyloxy-functionalized silane and a methacryloyloxy-functionalized silane.

Claim 2 (Canceled).

Claim 3 (Previously Presented): The membrane of claim 1, wherein said nonwoven includes said polymeric fiber, which is from 1 to 25  $\mu\text{m}$  in diameter.

Claim 4 (Previously Presented): The membrane of claim 1, wherein the porosity of said substrate is in the range from 50 to 97%.

Claim 5 (Previously Presented): The membrane of claim 1, wherein said coating on and in said substrate comprises an oxide of a metal selected from the group consisting of Al, Zr, Si, Ti, Y and mixtures thereof.

Claim 6 (Canceled).

Claim 7 (Previously Presented): The membrane of claim 1, wherein said membrane has an average pore size in the range of from 10 to 2000 nm.

Claim 8 (Previously Presented): The membrane of claim 1, wherein said membrane has a tensile strength of more than 1 N/cm.

Claim 9 (Previously Presented): The membrane of claim 1, wherein said membrane is bendable around a radius down to 100 mm without damage.

Claim 10 (Previously Presented): The membrane of claim 1, wherein said membrane is bendable around a radius down to 2 mm without damage.

Claim 11 (Previously Presented): A process for producing a membrane as claimed in claim 1 comprising providing a substrate from 10 to 200  $\mu\text{m}$  in thickness, selected from the group consisting of nonwovens of polymeric fiber, natural fiber and mixtures thereof having a porosity of more than 50%, with a coating, said coating being a porous ceramic coating which is brought onto and into said substrate by applying a suspension and heating one or more times to solidify said suspension on and in said substrate, said suspension comprising at

least one oxide of a metal selected from the group consisting of Al, Zr, Si, Ti, Y and mixtures thereof and a sol.

Claim 12 (Original): The process of claim 11, wherein said suspension is brought onto and into said substrate by printing on, pressing on, pressing in, rolling on, knife coating on, spread coating on, dipping, spraying or pouring on.

Claim 13 (Canceled).

Claim 14 (Previously Presented): The process of claim 11, wherein said suspension comprises at least one metal oxide sol, at least one semimetal oxide sol or at least one mixed metal oxide sol or a mixture thereof and is prepared by suspending at least one inorganic component in at least one of these sols.

Claim 15 (Original): The process of claim 14, wherein said sols are obtained by hydrolyzing at least one metal compound, at least one semimetal compound or at least one mixed metal compound using water or an acid or a combination thereof.

Claim 16 (Previously Presented): The process of claim 14, wherein said sol comprises less than 50% by weight of water and/or acid.

Claim 17 (Previously Presented): The process of claim 15, wherein said metal compound hydrolyzed is at least one metal alkoxide compound or at least one semimetal alkoxide compound selected from alkoxide compounds of the elements selected from the



group consisting of Zr, Al, Si, Ti, Y and mixtures thereof or at least one metal nitrate, metal carbonate or metal halide selected from metal salts of the elements selected from the group consisting of Zr, Al, Si, Ti, Y and mixtures thereof.

Claim 18 (Previously Presented): The process of claim 14, wherein said inorganic component suspended is at least one oxide selected from the oxides of the elements selected from the group consisting of Y, Zr, Al, Si, Ti and mixtures thereof.

Claim 19 (Previously Presented): The process of claim 11, wherein the mass fraction of said suspended component is from 0.1 to 500 times that of the sol used.

Claim 20 (Previously Presented): The process of claim 11, further comprising adding an adhesion promoter to said suspension.

Claim 21 (Previously Presented): The process of claim 11, further comprising adding an adhesion promoter on said fibers prior to said applying of said suspension.

Claim 22 (Previously Presented): The process of claim 20, wherein said adhesion promoter is selected from the organofunctional silanes and/or the oxides of the elements selected from the group consisting of Zr, Al, Si, Ti and mixtures thereof.

Claim 23 (Canceled).

Claim 24 (Previously Presented): The process of claim 11, wherein said suspension present on and in the support is solidified by heating at from 50 to 350°C.

Claim 25 (Original): The process of claim 24, wherein said heating is effected at from 110 to 280°C for from 0.5 to 10 minutes.

Claim 26 (Previously Presented): A method for producing batteries comprising placing a membrane as claimed in claim 1 in a battery as a separator.

Claim 27 (Previously Presented): A method comprising utilizing a membrane as claimed in claim 1 as a carrier for ultra-filtration, nanofiltration, reverse osmosis, gas separation or pervaporation membranes.

Claim 28 (Previously Presented): A method for microfiltration comprising placing a membrane as claimed in claim 1 in a microfiltration device.

Claim 29 (Canceled).

Claim 30 (Previously Presented): The process of claim 15, wherein said sol comprises less than 50% by weight of water and/or acid.

Claim 31 (Previously Presented): The process of claim 21, wherein said adhesion promoter comprises at least one oxide of the elements selected from the group consisting of Zr, Al, Si, Ti and mixtures thereof.

Claim 32 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyacrylonitrile fiber.

Claim 33 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyamide fiber.

Claim 34 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyimide fiber.

Claim 35 (Previously Presented): The membrane of claim 1, wherein the polymer fiber is a polyacrylate fiber.

Claim 36 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is polytetrafluoroethylene fiber.

Claim 37 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is polyester fiber.

Claim 38 (Previously Presented): The membrane of claim 1, wherein the polymeric fiber is a polyolefin fiber.

Claim 39 (Canceled).

Claim 40 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is at least one selected from the group consisting of 3-glycidyloxytrimethoxysilane and 3-meth-acryloyloxypropyltrimethoxysilane.

Claims 41-45 (Canceled).

Claim 46 (Previously Presented): The membrane of claim 1, wherein the substrate consists of one nonwoven polymeric fiber.

Claim 47 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is a glycidyloxy-functionalized silane.

Claim 48 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is a methacryloyloxy-functionalized silane.

Claim 49 (Previously Presented): The membrane of claim 1, wherein the nonwoven polymeric fiber has a softening temperature of 100°C or more.

Claim 50 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is 3-glycidyloxytrimethoxy silane.

Claim 51 (Previously Presented): The membrane of claim 1, wherein the adhesion promoter is 3-methacryloyloxy propyltrimethoxy silane.

Claim 52 (Canceled).

Claim 53 (Previously Presented): A membrane, comprising:

a sheetlike flexible substrate having a multiplicity of openings and having a porous coating on and in said substrate, said coating consisting of a homogeneous mixture of an adhesion promoter-containing composition and one or more inorganic oxide components,

wherein the material of said substrate is a nonwoven polymeric fiber selected from the group consisting of a poly-acrylonitrile fiber, a polyamide fiber, a polyimide fiber, a poly-acrylate fiber, a polytetrafluoroethylene fiber, a polyester fiber, a polyolefin fiber and mixtures thereof, said material having a porosity of more than 50%, said substrate being from 10 to 200  $\mu\text{m}$  in thickness, and said coating being a porous ceramic coating,

wherein the adhesion promoter-containing composition is a reaction product of a mixture that consists of water, HCl, ethanol, tetraethoxy silane, methyltrimethoxy silane and at least one of a glycidyloxy-functionalized silane and a methacryloyloxy-functionalized silane.

Claim 54 (Previously Presented): The membrane of claim 53, wherein said nonwoven includes said polymeric fiber, which is from 1 to 25  $\mu\text{m}$  in diameter.

Claim 55 (Previously Presented): The membrane of claim 53, wherein said membrane has an average pore size in the range of from 10 to 2000 nm.

Claim 56 (Previously Presented): The membrane of claim 53, wherein said membrane is bendable around a radius down to 100 mm without damage.

Claim 57 (Previously Presented): The membrane of claim 53, wherein said membrane is bendable around a radius down to 2 mm without damage.

Claim 58 (Previously Presented): The membrane of claim 53, wherein the adhesion promoter-containing product consists of reacted units of the water, the tetraethoxy silane, the methyltrimethoxysilane and at least one of the 3-glycidyloxytrimethoxysilane and the 3-meth-acryloyloxypropyltrimethoxysilane.

Claim 59 (Previously Presented): A process for producing the membrane claimed in claim 53, comprising:

contacting the substrate with a sol comprising the adhesion promoter and the inorganic oxide components to coat the substrate with the sol,

heating the substrate coated with the sol to dry the sol on and in the substrate and form the coating.

IX. EVIDENCE APPENDIX

Mesh and pore size information.

# Mesh (scale)

From Wikipedia, the free encyclopedia

Mesh material is often used in determining the particle size distribution of a granular material. For example, a sample from a truckload of peanuts may be placed atop a mesh with 5 mm openings. When the mesh is shaken, small broken pieces and dust pass through the mesh while whole peanuts are retained on the mesh. A commercial peanut buyer might use a test like this to determine if a batch of peanuts has too many broken pieces. This type of test is common in some industries, and to facilitate uniform testing methods, several **standardized mesh series** have been established.

Applicable standards are ISO 565 (1987), ISO 3310 (1999), ASTM E 11-70 (1995), DIN 4188 (1977), BS 410 (1986) and AFNOR NFX11-501 (1987).

Contents
<ul style="list-style-type: none"><li>1 Tyler mesh size</li><li>2 Variation in mesh openings</li><li>3 Particle size distribution</li><li>4 Abrasives</li><li>5 Sieve sizing and conversion charts</li><li>6 References</li></ul>

## Tyler mesh size

One well-known mesh series is the Tyler Equivalent created by the W.S. Tyler screening company.<sup>[1]</sup> Tyler mesh size is the number of openings per (linear) inch of mesh. To calculate the size of the openings in a mesh the thickness of the wires making up the mesh material must be taken into account. In practice, mesh openings are determined referring to a chart like the one below. Mesh size given as 4\*4 means the number of squares in one inch horizontally is 4 and vertically is 4.

## Variation in mesh openings

Some standards use the mesh designation as the number of wires rather than the size of openings (see Tyler, above). There can be significant differences in particle size passing small laboratory screens versus large heavy-duty industrial screens due to the different wire sizes used. Thicker wire results in a smaller opening size for an equivalent mesh. An example of variation moving between machine sizes is:<sup>[2]</sup>

Laboratory sieve cloth <sup>[3]</sup>				
Sieve Designation	Wire width	Opening		
	[mm]	[inches]	[mm]	[inches]
10 Mesh	U.S. Std. No. 12 0.800	0.0315	1.7	0.0669 (0.0661 nominal)



Medium industrial screen cloth

Sieve	Wire Width	Opening	Opening
10 Mesh	0.035 in	0.0650 in	1651 $\mu\text{m}$

Heavy industrial screen cloth

Sieve	Wire Width	Opening	Opening
10 Mesh	0.047 in	0.053 in	1346 $\mu\text{m}$

## Particle size distribution

Powders and granular materials are sometimes described as having a certain mesh size (e.g. 30 mesh sand). By itself, this type of description is somewhat ambiguous. More precise specifications will indicate that a material will pass through some specific mesh (that is, have a maximum size; larger pieces won't fit through this mesh) but will be retained by some specific tighter mesh (that is, a minimum size; pieces smaller than this will have passed through the mesh). This type of description establishes a range of particle sizes.

One notation for indicating particle size distribution using mesh size is to use + and - designations. A "+" before the sieve mesh indicates the particles are retained by the sieve, while a "-" before the sieve mesh indicates the particles pass through the sieve. This means that typically 90% or more of the particles will have mesh sizes between the two values.

For instance, if the particle size of a material is described as -80/+170 (or could also be written -80 +170), then 90% or more of the material will pass through an 80 mesh sieve and be retained by a 170 mesh sieve. Using the conversion chart below, the resulting particles will have a range of diameters between 0.089 and 0.178 mm (89 and 178 micrometers).

## Abrasives

The Federation of European Producers of Abrasives (FEPA) has four sets of standards to denote size of grains coupled with the type of abrasive. The standards indicate a range of grit sizes that may come within any single designator which consists of a letter (F for bonded abrasives and P for coated abrasives) and a number. Within each series are two standards detailing the larger macrogrit (approximately 12 – 240) and smaller microgrit (approximately 230 – 2000 or 2500) sizes and the different process by which sizes are determined (sieving for the larger grits and sedimentation for the smaller).

While following the common practice of smaller designators meaning coarser grits and similar cut-off marks between macro- and microgrit standards, the F and P series are not compatible. While F 12 and P 12 are only about 3% different in size, P 2000 is more than 750% larger than F 2000 (that is, the particles in F 2000 are about 8.5 times as large as those in P 2000). [4][5]

Metal surfaces mechanically polished are designated as having a mechanical finish related to the abrasive used.

## Sieve sizing and conversion charts

Typical openings in laboratory sieve series

Sieve size (mm)	BSS	Tyler (approx)	US (approx)
4.75	-	4	4
3.35	5	6	6
2.81	6	7	7
2.38	7	8	8
2.00	8	9	10
1.68	10	10	12
1.40	12	12	14
1.20	14	14	16
1.00	16	16	18
0.853	18	20	20
0.710	22	24	25
0.599	25	28	30
0.500	30	32	35
0.422	36	35	40
0.354	44	42	45
0.297	52	48	50
0.251	60	60	60
0.211	72	65	70
0.178	85	80	80
0.152	100	100	100
0.125	120	115	120
0.104	150	150	140
0.089	170	170	170
0.075	200	200	200
0.066	240	250	230
0.053	300	270	270
0.044	350	325	325
0.037	440	400	400

In addition to standard U.S. and Tyler mesh sizes, commercial sieves in the U.S. can also utilize three other standards. Market Grade sieves use thicker wire

than other commercial grades, and so they are commonly used for applications where mesh strength (and therefore screen life) is important. Mill Grade sieves use a thinner wire diameter, which provide more open area for a given mesh size. Therefore, Mill Grade sieves are used when throughput is more important than durability. Tensile Bolting Cloth uses very fine wire diameters, and thus provides the highest fraction of open area of all sieve types; it is often used for fine sifting and screen printing.

Commercial Sieve Mesh Dimensions

Sieve size (mm)	Opening (in)	Standard Mesh			Tensile Bolting Cloth			Mill Grade			Market Grade		
		US	Tyler	Mesh	Opening	Wire	Mesh	Opening	Wire	Mesh	Opening	Wire	
11.2	.438	7/16"	-	-	-	-	2	.466	.054	2	.437	.063	
6.3	.250	1/4"	-	-	-	-	3	.292	.041	3	.279	.054	
5.6	.223	3.5	3.5	-	-	-	4	.215	.035	4	.203	.0475	
4.75	.187	4	4	-	-	-	-	-	-	4	.187	.063	
4.0	.157	5	5	-	-	-	5	.168	.032	5	.159	.041	
3.35	.132	6	6	-	-	-	6	.139	.028	6	.132	.0348	
2.80	.110	7	7	-	-	-	7	.115	.028	7	.108	.035	
2.36	.0937	8	8	-	-	-	8	.100	.025	8	.0964	.0286	
2.0	.0787	10	9	-	-	-	9	.088	.023	10	.0742	.0258	
1.85	-	-	-	-	-	-	10	.080	.020	11	.073	.018	
1.7	.0661	12	10	14	.062	.009	12	.065	.018	12	.0603	.023	
1.4	.0555	14	12	16	.0535	.009	14	.054	.017	14	.051	.0204	
1.18	.0469	16	14	18	.0466	.009	16	.0465	.016	16	.0445	.0181	
1.04	-	-	-	20	.0410	.009	-	-	-	-	-	-	
1.0	.0394	18	16	22	.0380	.0075	18	.0406	.015	18	.0386	.0173	
.85	.0331	20	20	24	.0342	.0075	20	.0360	.014	20	.034	.0162	
.787	-	-	-	26	.0310	.0075	22	.0320	.0135	-	-	-	
.71	.0278	25	24	28	.0282	.0075	24	.0287	.013	24	.0277	.014	
.681	-	-	-	30	.0268	.0065	26	.0275	.011	-	-	-	
.63	-	-	-	32	.0248	.0065	28	.0275	.010	-	-	-	
.60	.0234	30	28	34	.0229	.0065	30	.0238	.0095	-	-	-	
.541	-	-	-	36	.0213	.0065	32	.0223	.009	-	-	-	
.50	.0197	35	32	38	.0198	.0065	34	.0204	.009	30	.0203	.0128	
.47	-	-	-	40	.0185	.0065	36	.0188	.009	-	-	-	
.465	-	-	-	42	.0183	.0055	38	.0178	.0085	-	-	-	

.437	-	-	-	-	-	-	-	-	.0172	.0055	-	-	-	-	-	.0176	.0118
.425	.0165	40	35	46	.0162	.0055	40	.0165	.0085	-	-	-	-	-	-	-	-
.389	-	-	-	48	.0153	.0055	-	-	-	-	-	-	-	-	40	.0150	.0104
.368	-	-	-	50	.0145	.0055	-	-	-	-	-	-	-	-	-	-	-
.355	.0139	45	42	52	.0137	.0055	45	.0142	.008	-	-	-	-	-	-	-	-
.33	-	-	-	54	.0130	.0055	-	-	-	-	-	-	-	-	-	-	-
.323	-	-	-	58	.0127	.0045	-	-	-	-	-	-	-	-	-	-	-
.31	-	-	-	60	.0122	.0045	50	.0125	.0075	-	-	-	-	-	-	-	-
.30	.0117	50	48	62	.0116	.0045	55	.0112	.007	-	-	-	-	-	-	-	-
.282	-	-	-	64	.0111	.0045	-	-	-	-	-	-	-	-	50	.0110	.0090
.27	-	-	-	70	.0106	.0037	-	-	-	-	-	-	-	-	-	-	-
.26	-	-	-	72	.0102	.0037	-	-	-	-	-	-	-	-	-	-	-
.25	.0098	60	60	74	.0098	.0037	60	.0102	.0065	-	-	-	-	-	-	-	-
.241	-	-	-	76	.0095	.0037	-	-	-	-	-	-	-	-	-	-	-
.231	-	-	-	78	.0091	.0037	-	-	-	-	-	-	-	-	60	.0092	.0075
.224	-	-	-	80	.0088	.0037	-	-	-	-	-	-	-	-	-	-	-
.212	.0083	70	65	84	.0084	.0035	-	-	-	-	-	-	-	-	-	-	-
.20	-	-	-	88	.0079	.0035	-	-	-	-	-	-	-	-	-	-	-
.193	-	-	-	90	.0076	.0035	-	-	-	-	-	-	-	-	-	-	-
.18	.0070	80	80	94	.0071	.0035	-	-	-	-	-	-	-	-	80	.0070	.0055
.165	-	-	-	105	.0065	.0030	-	-	-	-	-	-	-	-	-	-	-
.15	.0059	100	100	120	.0058	.0025	-	-	-	-	-	-	-	-	100	.0055	.0045
.125	.0049	120	115	145	.0047	.0022	-	-	-	-	-	-	-	-	120	.0046	.0037
.106	.0041	140	150	165	.0042	.0019	-	-	-	-	-	-	-	-	150	.0041	.0026
.090	.0035	170	170	200	.0034	.0016	-	-	-	-	-	-	-	-	180	.0033	.0023
.075	.0029	200	200	230	.0029	.0014	-	-	-	-	-	-	-	-	200	.0029	.0021
.063	.0025	230	250	-	-	-	-	-	-	-	-	-	-	-	250	.0024	.0016
.053	.0021	270	270	300	.0021	.0012	-	-	-	-	-	-	-	-	270	.0021	.0016
.045	.0017	325	325	-	-	-	-	-	-	-	-	-	-	-	325	.0017	.0014
.038	.0015	400	400	-	-	-	-	-	-	-	-	-	-	-	400	.0015	.0010
.025	.0010	500	-	-	-	-	-	-	-	-	-	-	-	-	500	.0010	.0010

.020	.0008	632	-	-	-	-	-	635	.0008	.0008
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Further information on equivalent mesh sizes from 5µm to 25.4mm is available [6] Available sieve sizes are usually regulated by standards. Those in common use are ISO 565:1990 and ISO 3310-1:2000 (international), EN 933-1(European) and ASTM E11:01 (US). EN standards are available with national 'badging' so appear as BS EN , FR EN, DE EN, etc. A comparison is available [7].

Although such information contains long lists of sieve sizes, in practice sieves are normally used in series in which each member sieve is selected to pass particles approximately  $1/\sqrt{2}$  or  $1/2$  smaller in size than the previous sieve. For example the series 80mm, 63, 40, 31.5, 20, 16, 14, 10, 8, 6.3, 4, 2.8, 2mm is routinely available in many European countries or the series with the larger steps 63, 31.5, 16, 8, 4, 2, 1mm, 500µm, 250, 125, 63µm is commonly used to grade aggregates in the construction industry. Such series are somewhat derived from the principles originally established by Renard and now known as Renard's Series; see Preferred number. Some users replace some of those indicated above with 45, 22.4, 12.5, 11.2 and 5.6mm sieves, mostly because of historical usage of such sizes in their country or industry.

## References

1. ^ *Particle Size – US Sieve Series and Tyler Mesh Size Equivalents* (<http://www.azom.com/details.asp?ArticleID=1417>), <http://www.azom.com/details.asp?ArticleID=1417>, retrieved 2009-04-28.
2. ^ ed. N.L. Weiss, "SME Mineral Processing Handbook", 1985, pp 3E-25 to 3E-41
3. ^ *W.S. Tyler laboratory screen catalogue* ([http://www.wstyler.com/assets/files/Product%20And%20Price%20Catalog\(1\).pdf](http://www.wstyler.com/assets/files/Product%20And%20Price%20Catalog(1).pdf)), W.S. Tyler Canada, 2006, pp. 3–4, [http://www.wstyler.com/assets/files/Product%20And%20Price%20Catalog\(1\).pdf](http://www.wstyler.com/assets/files/Product%20And%20Price%20Catalog(1).pdf).
4. ^ FEPA-standard 43-1 & FEPA-standard 43-2 (<http://www.fepa-abrasives.org/DesktopDefault.aspx?portalname=www.fepa-abrasives.org&language=E&folderindex=0&folderid=3&headingid=5&headingindex=1&tabid=273>)
5. ^ FEPA-Standard 42-1 & FEPA-Standard 42-2 (<http://www.fepa-abrasives.org/DesktopDefault.aspx?portalname=www.fepa-abrasives.org&language=E&folderindex=0&folderid=3&headingid=5&headingindex=0&tabid=272>)
6. ^ *Equivalent mesh sizes from 5microns to 25.4mm* (<http://delloyd.50megs.com/moreinfo/mesh.html>), <http://delloyd.50megs.com/moreinfo/mesh.html>, retrieved 2009-05-19.
7. ^ *A comparison of widely used sieve size specifications* ([http://www.nexlab.ru/files/equipment/%D1%81%D0%BF%D1%86%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%86%D0%B8%D0%B8%D0%B8%D1%82.pdf](http://www.nexlab.ru/files/equipment/%D1%81%D0%BF%D1%86%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%86%D0%B8%D0%B8%D0%B8%D0%B8%D1%82.pdf)), <http://www.nexlab.ru/files/equipment/%D1%81%D0%BF%D1%86%D0%B8%D1%84%D0%B8%D0%BA%D0%B0%D1%86%D0%B8%D0%B8%D0%B8%D1%82.pdf>, retrieved 2009-05-19.

Retrieved from "http://en.wikipedia.org/wiki/Mesh\_(scale)"

Categories: Customary units of measure | Systems of units

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## Sieves Standard no. and Mesh sizes

### Standard sieves designations

See below for Particle size conversions

Mesh Size (microns)	TYLER	ASTM-E11	BS-410	DIN-4188
µm	Mesh	No.	Mesh	mm
5	2500		2500	0.005
10	1250		1250	0.010
15	800		800	0.015
20	625		625	0.020
22				0.022
25	500		500	0.025
28				0.028
32				0.032
36				0.036
38	400	400	400	
40				0.040
45	325	325	350	0.045
50				0.050
53	270	270	300	
56				0.056
63	250	230	240	0.063
71				0.071
75	200	200	200	
80				0.080
90	170	170	170	0.090
100				0.100
106	150	140	150	
112				0.112
125	115	120	120	0.125
140				0.140
150	100	100	100	
160				0.160
180	80	80	85	0.180
200				0.200
212	65	70	72	
250	60	60	60	0.250
280				0.280
300	48	50	52	
315				0.315
355	42	45	44	0.355
400				0.400
425	35	40	36	
450				0.450
500	32	35	30	0.500
560				0.560
600	28	30	25	

## Particle Size Conversion

Sieve Designation		Nominal Sieve Opening		
Standard	Mesh	Inches	mm	Microns
25.4mm	1 in.	1.00	25.4	25400
22.6mm	7/8 in.	0.875	22.6	22600
19.0mm	3/4 in.	0.750	19.0	19000
16.0mm	5/8 in.	0.625	16.0	16000
13.5mm	0.530 in.	0.530	13.5	13500
12.7mm	1/2 in.	0.500	12.7	12700
11.2mm	7/16 in.	0.438	11.2	11200
9.51mm	3/8 in.	0.375	9.51	9510
8.00mm	5/16 in.	0.312	8.00	8000
6.73mm	0.265 in.	0.265	6.73	6730
6.35mm	1/4 in.	0.250	6.35	6350
5.66mm	No. 3 1/2	0.223	5.66	5660
4.76mm	No. 4	0.187	4.76	4760
4.00mm	No. 5	0.157	4.00	4000
3.36mm	No. 6	0.132	3.36	3360
2.83mm	No. 7	0.111	2.83	2830
2.38mm	No. 8	0.0937	2.38	2880
2.00mm	No. 10	0.0787	2.00	2000
1.68mm	No. 12	0.0661	1.68	1680
1.41mm	No. 14	0.0555	1.41	1410
1.19mm	No. 16	0.0496	1.19	1190
1.00mm	No. 18	0.0394	1.00	1000
841µm	No. 20	0.0331	0.841	841
707µm	No. 25	0.0278	0.707	707
595µm	No. 30	0.0234	0.595	595
500µm	No. 35	0.0197	0.500	500
420µm	No. 40	0.0165	0.420	420
345µm	No. 45	0.0139	0.354	354
297µm	No. 50	0.0117	0.297	297

250µm	No. 60	0.0098	0.250	250
210µm	No. 70	0.0083	0.210	210
177µm	No. 80	0.0070	0.177	177
149µm	No. 100	0.0059	0.149	149
125µm	No. 120	0.0049	0.125	125
105µm	No. 140	0.0041	0.105	105
88µm	No. 170	0.0035	0.088	88
74µm	No. 200	0.0029	0.074	74
63µm	No. 230	0.0025	0.063	63
53µm	No. 270	0.0021	0.053	53
44µm	No. 325	0.0017	0.044	44
37µm	No. 400	0.0015	0.037	37

**NOTES:**

Larger sieve openings (1 in. to 1/4 in.) have been designated by a sieve "mesh" size that corresponds to the size of the opening in inches.

Smaller sieve "mesh" sizes of 3 1/2 to 400 are designated by the number of openings per linear inch in the sieve.

The following convention is used to characterize particle size by mesh designation:

a "+" before the sieve mesh indicates the particles are retained by the sieve; a "-" before the sieve mesh indicates the particles pass through the sieve; typically 90% or more of the particles will lie within the indicated range.

For example, if the particle size of a material is described as -4 +40 mesh, then 90% or more of the material will pass through a 4-mesh sieve (particles smaller than 4.76 mm) and be retained by a 40-mesh sieve (particles larger than 0.420 mm).

If a material is described as -40 mesh, then 90% or more of the material will pass through a 40-mesh sieve (particles smaller than 0.420 mm).

This information is also provided on page T848 of the Aldrich 2003-2004 Catalog/Handbook of Fine Chemicals.



X. RELATED APPEALS APPENDIX

11/578,664 - PENDING

August 21, 2009 Appeal Brief

November 30, 2009 Examiner's Answer.

10/524,665 – REVERSED

February 1, 2010 – Decision

September 25, 2008 – Examiner's Answer

July 7, 2008 – Appeal Brief

10/524,143 – REVERSED

February 2, 2010 – Decision

February 2, 2010 – Reply Brief

September 5, 2008 – Examiner's Answer

July 3, 2008 – Appeal Brief



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
11/578,664	08/17/2007	Gerhard Horpel	297704US0PCT	7172
22850	7590	11/30/2009		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER ARCIERO, ADAM A	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 11/30/2009	DELIVERY MODE ELECTRONIC

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 11/578,664  
Filing Date: August 17, 2007  
Appellant(s): HORPEL ET AL.

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Harris A. Pitlick  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed August 21, 2009 appealing from the Office action mailed June 02, 2009.

**1) *Real Party in Interest***

A statement identifying the real party in interest is contained in the brief.

**2) *Related Appeals and Interferences***

A statement identifying the related appeals and interferences which will directly affect or be directly affected by or have a bearing on the decision in the pending appeal is contained in the brief.

**3) *Status of Claims***

The statement of the status of the claims contained in the brief is correct.

**4) *Status of Amendments After Final***

The Appellants' statement of the status of amendments after final rejection contained in the brief is correct.

**5) *Summary of Claimed Subject Matter***

The summary of claimed subject matter contained in the brief is correct.

**6) *Grounds of Rejection to be Reviewed on Appeal***

The Appellants' statement of the grounds of rejection in the brief is correct.

**7) *Claims Appendix***

The copy of the appealed claims contained in the Appendix to the brief is correct.

**8) *Evidence Relied Upon***

None.

**9) *Grounds of Rejection***

The following grounds(s) of rejection are applicable to the appealed claims:

1. Claims 1 and 2, are rejected under 35 U.S.C. 103(a) as being unpatentable over Hennige et al. (WO 03/021697) (See corresponding US 7,351,494 for translation) in view of Maruo et al. (WO 2004/021500) (see corresponding US 2006/0035137 for translation) and further in view of Yoshioka et al. (US 6,485,862).

Regarding claims 1 and 2, Hennige discloses a process for producing a separator, utilized within a lithium battery, comprising a sheet-like flexible substrate having a multiplicity of openings and having a coating on and in said substrate, the material of said substrate being woven electrically nonconductive fibers of glass and said coating being a porous electrically insulating ceramic coating, wherein the substrate is a woven glass fiber fabric comprising woven fibers or filaments. See claim 1 and See column 9 lines 33-37. The coating is preferably applied to the substrate by applying to said substrate a suspension comprising at least one inorganic component comprising a compound of at least one metal, one semimetal or one mixed metal with at least one element of the 3rd to 7th main group and a sol and heating one or more times to solidify said suspension comprising at least one inorganic component on or in or else on and in the support. Hennige discloses the electrolyte is bendable and machined into wound cells (filling

the separator with an electrolyte). See column 2 lines 24-30. However, Hennige does not disclose the composition of the electrolyte.

Maruo discloses a nonaqueous electrolyte secondary battery comprising an electrolyte solution with an ionic liquid (1-ethyl-3-methylimidazolium tetrafluoroborate) from 1 to 60 weight percent of the electrolyte solution. See paragraphs 5, 59 and 169. Therefore, it would have been obvious to one having ordinary skill in the art to utilize the electrolyte composition with the separator of Hennige because Maruo discloses the electrolyte comprising with up to 60 weight percent of ionic liquid provides a battery with improvements in the cycle life and stability. See paragraph 60. In the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. *In re Wertheim* 541 F.2d 257, 191 USPQ 90 (CCPA 1976). Hennige and Mauro do not disclose the process of installing a separator comprising and further filling the separator with an electrolyte.

Yoshioka discloses a method of manufacturing a lithium battery that has an electrolyte impregnated into the separator is carried out at a reduced pressure. See column 4 lines 55-60. The resultant battery is sealed at reduced pressure and room temperature. See claim 5. Yoshioka further discloses a method for manufacturing a lithium battery comprising a separator disposed within a battery; subsequently the battery is filled with electrolyte whereby the separator is impregnated with the electrolyte (filling the separator with the electrolyte after the separator is installed in the battery). See figures 1a-1d and column 2 lines 25-60. Therefore it would have been obvious to one having ordinary skill in the art to utilize the manufacturing method for formulating a lithium battery of Hennige and Mauro with an impregnated separator because Yoshioka discloses a method for filling a battery body with an electrolyte solution without

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expanding the volume of the battery even if the battery is put into a high-temperature environment and without involving a rise in the internal resistance of the battery. See column 2 lines 9-16.

2. Claims 23 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hennige et al. (WO 03/021697) (See corresponding US 7,351,494 for translation) in view of Maruo et al. (WO 2004/021500) (see corresponding US 2006/0035137 for translation).

Regarding claim 23, Hennige discloses a process for producing a separator comprising a sheet-like flexible substrate having a multiplicity of openings and having a coating on and in said substrate, the material of said substrate being woven electrically nonconductive fibers of glass and said coating being a porous electrically insulating ceramic coating, wherein the substrate is a woven glass fiber fabric comprising woven fibers or filaments. See claim 1. Hennige discloses the electrolyte is bendable and machined into wound cells. (filling the separator with an electrolyte). See column 2 lines 24-30. The coating is preferably applied to the substrate by applying to said substrate a suspension comprising at least one inorganic component comprising a compound of at least one metal, one semimetal or one mixed metal with at least one element of the 3rd to 7th main group and a sol and heating one or more times to solidify said suspension comprising at least one inorganic component on or in or else on and in the support. However, Hennige does not disclose the composition of the electrolyte.

Maruo discloses a nonaqueous electrolyte secondary battery comprising an electrolyte solution with an ionic liquid (1-ethyl-3-methylimidazolium tetrafluoroborate) with 1 to 60 weight percent of the electrolyte solution. See paragraphs 5, 59 and 169. Therefore, it would

have been obvious to one having ordinary skill in the art to utilize the electrolyte composition with the separator of Hennige because Maruo discloses the electrolyte comprising with 1 to 60 weight percent of ionic liquid provides a battery with improvements in the cycle life and stability. See paragraph 60. In the case where the claimed ranges “overlap or lie inside ranges disclosed by the prior art” a prima facie case of obviousness exists. *In re Wertheim* 541 F.2d 257, 191 USPQ 90 (CCPA 1976).

3. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hennige et al. (WO 03/021697) (See corresponding US 7,351,494 for translation) in view of Maruo et al. (WO 2004/021500) (see corresponding US 2006/0035137 for translation) as applied to claim 23 above, and further in view of Yoshioka et al. (US 6,485,862).

Regarding claim 24, Hennige and Maruo disclose a process for producing a separator comprising an electrolyte as recited in paragraph 3 above. However, Hennige do not disclose the temperature at which the impregnating step is carried out at.

Yoshioka discloses a method of manufacturing a lithium battery that has an electrolyte impregnated into the separator is carried out at a reduced pressure. See column 4 lines 55-60. The resultant battery is sealed at reduced pressure and room temperature. See claim 5. Therefore, it would have been obvious to one having ordinary skill in the art to that the electrolyte is impregnated at room temperature because Yoshioka discloses that at the time of sealing which is after the impregnation of the electrolyte into the separator the lithium battery is sealed at room temperature, to avoid the evaporation of electrolytic solution, without any cooling or removal of heat before sealing the lithium battery. See column 2 lines 25-60.



Regarding claim 25, Hennige and Maruo disclose a separator can be utilized in a lithium battery as recited in paragraph 3 above. Hennige and Maruo do not disclose the process of formulating a separator, comprising an electrolyte, into a battery per se.

Yoshioka discloses a method for manufacturing a lithium battery comprising a separator disposed within a battery; subsequently the battery is filled with electrolyte whereby the separator is impregnated with the electrolyte. See figures 1a-1d and column 2 lines 25-60. Therefore it would have been obvious to one having ordinary skill in the art to utilize the manufacturing method for formulating a lithium battery with an impregnated separator because Yoshioka discloses a method for filling a battery body with an electrolyte solution without expanding the volume of the battery even if the battery is put into a high-temperature environment and without involving a rise in the internal resistance of the battery. See column 2 lines 9-16.

#### **10) Response to Arguments**

1. *One of ordinary skill in the art would not have combined Hennige et al. and Maruo et al. There are hundred or more types of separators that are useful in batteries, without improper hindsight reasoning, would one choose the ceramic separator of Hennige et al. for use with Maruo et al.'s electrolyte composition? By their preference of a cellulose-based separator, Maruo et al. shows that they are primarily concerned with lyophilicity. Neither Hennige et al. nor Maruo et al. could have predicted that with the use of ceramic separators, the electrolyte composition of the present invention provides a much better wettability when used with the said ceramic separator compared to its use with prior art polyolefin separators (claim 1).*

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Furthermore, Hennige et al. discloses a woven electrically nonconductive glass fiber separator of claim 1, as discussed above in the rejections. Maruo et al. teaches of useful separators for lithium batteries such as glass fiber sheets, as discussed above in the rejections. Maruo et al. further teaches of an electrolyte solution with an ionic liquid at a weight fraction of 1-60 weight percent, as discussed above. Maruo et al. further teaches that it would be obvious to one of ordinary skill in the art at the time of the invention, to employ such an electrolyte solution comprising an ionic liquid in a weight percent of 1-60% because the use of such an electrolyte in secondary batteries provides cells with better low-temperature characteristics (pg. 4, [0049]).

Furthermore, according to MPEP 2131.02, the courts have held that the comprehensiveness of the listing of separators in the Hennige et al. reference did not negate the fact that the separator claimed was specifically taught. *Ex parte A*, 17 USPQ2d 1716 (Bd. Pat. App. & Inter. 1990).

**11) *Related Proceedings Appendix***

None.

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Art Unit: 1795

Page 9

For the above reasons, it is believed that all the rejections should be sustained.

/Adam A Arciero/

Examiner, Art Unit 1795

/Dah-Wei D. Yuan/

Supervisory Patent Examiner, Art Unit 1795

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

DOCKET NO: 297704US0PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
GERHARD HOERPEL, ET AL. : EXAMINER: SUITTE, B. P.  
SERIAL NO: 11/578,664 :  
FILED: AUGUST 17, 2007 : GROUP ART UNIT: 1795  
FOR: USE OF A CERAMIC SEPARATOR :  
IN LITHIUM ION BATTERIES,  
COMPRISING AN ELECTROLYTE  
CONTAINING IONIC FLUIDS

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated June 2, 2009 of Claims 1, 2, and 23-25.

A Notice of Appeal is **submitted herewith**.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Evonik Degussa GmbH, having an address at Bennigsenplatz 1, 40474 Duesseldorf, Germany.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### III. STATUS OF THE CLAIMS

Claims 1, 2 and 23-25 stand rejected and are herein appealed. Claims 4-22, 26 and 27 stand withdrawn from consideration. Claim 3 has been canceled.

### IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed.

### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A summary of the claimed subject matter, as claimed in independent Claims 1 and 23, is mapped out below, with reference to page and line numbers in the specification added in **[bold]** after each element.

Claim 1. A method comprising installing a separator in a battery, **[page 25, lines 1-2]** wherein the separator has a ceramic surface and which comprises a sheetlike flexible substrate which has a multiplicity of openings and a coating present on and in this substrate, **[page 4, lines 29-33]** the material of the substrate being selected from woven or non-woven nonelectroconductive natural or polymeric fibers and the coating being a porous electroinsulating ceramic coating, **[page 4, lines 33-37]** the separator being filled with an electrolyte composition comprising a conducting salt and a base component, the main constituent of the base component, at a fraction of greater than 50% by mass, being at least one ionic liquid having a melting point of less than 100°C, **[page 4, line 37 to page 5, line 4]** and wherein the separator is filled with the electrolyte either before or after the separator is installed in the battery. **[page 24, line 36 to page 25, line 1]**

Claim 23. A process for producing a separator **[page 5, lines 21-22]** comprising providing a sheetlike flexible substrate which has a multiplicity of openings being provided with a coating in and on the substrate, **[page 5, lines 23-25]** applying a suspension which

comprises particles of at least one inorganic compound suspended in a sol to the substrate and heating to solidify the suspension on and in the carrier, [page 5, lines 27-29] wherein the separator thus prepared is impregnated with an electrolyte composition comprising a conducting salt and a base component, the main constituent of the base component, at a fraction of greater than 50% by mass, being at least one ionic liquid having a melting point of less than 100°C. [page 5, lines 30-35]

#### VI. GROUNDS OF REJECTION

##### Ground (A)

Claims 1, 2 and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over WO 03/021697 [relying on its English language equivalent US 7,351,494 (Hennige et al)] in view of WO 2004/021500 [relying on its English language equivalent US 2006/0035137 (Maruo et al)].

##### Ground (B)

Claims 24 and 25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hennige et al in view of Maruo et al, and further in view of US 6,485,862 (Yoshioka et al).

#### VII. ARGUMENT

##### Ground (A)

Claims 1, 2 and 23 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hennige et al in view of Maruo et al. The rejection is untenable and should not be sustained.

Hennige et al discloses a ceramic separator useful, for example, as a separator for a battery, but does not disclose filling the separator with an electrolyte composition comprising an ionic liquid. The Examiner thus relies on Maruo et al.

Maruo et al discloses a nonaqueous electrolyte which contains an ionic liquid, which is a particular quaternary ammonium or phosphonium compound of general formula (1) therein and having a melting point not higher than 50°C; a compound which reductively decomposes at a more noble potential than the ionic liquid; and a lithium salt [0011]. Maruo et al discloses further that their nonaqueous electrolyte may be used as the electrolyte in a secondary cell containing, *inter alia*, a separator [0119], and discloses “non-limiting” examples of separator materials which are all either natural or synthetic polymeric or organic materials or glass fiber-based materials [0141]. The separator is disclosed as not subject to any particular limitation in structure, and may have a single-layer structure or a multilayer structure composed of a plurality of laminated films or sheets [0142], wherein the separator is preferably in the form of a porous film or porous sheet [0143], the material making up the porous film or porous sheet not being subject to any particular limitation, although it is preferable to use as such film or sheet one composed primarily of cellulose [0145]. When such a separator is used, hydroxyl groups on the cellulose molecules strongly interact with the highly polar electrolyte molecules, giving the separator a better lyophilicity than that of a polyolefin separator [0149].

The Examiner holds that it would have been obvious to use the electrolyte composition of Maruo et al with the separator-battery combination of Hennige et al.

In reply, without the present disclosure as a guide, one of ordinary skill in the art would not have combined Hennige et al and Maruo et al. There are probably hundreds, if not more, types of separators that are useful in batteries. Why, without the present disclosure as a guide, would one choose the ceramic separator of Hennige et al for use with Maruo et al’s electrolyte composition? By their preference of a cellulose-based separator, Maruo et al shows that they are primarily concerned with lyophilicity which, because of the hydroxyl groups present on the cellulose molecules, provides a much better lyophilicity than would be

provided by prior art polyolefin separators. But neither Hennige et al nor Maruo et al could have predicted that with the use of ceramic separators, the electrolyte composition of the present invention provides a much better wettability when used with the presently-recited ceramic separator compared to its use with prior art polyolefin separators. This advantage is demonstrated in the specification herein by Figs. 1-3, which show how much an ionic liquid is sucked into a separator based on capillary forces as a function of time. Fig. 1 depicts two curves, the Separion curve indicating the wetting behavior of a ceramic separator according to the present invention and the PO separator curve indicating the wetting behavior of a conventional polyolefin separator. It is clearly visible in Fig. 1 that the ceramic separator is wetted more rapidly, and the height of rise is much higher than the PO separator. Figs. 2 and 3 indicate the wetting behavior curves only for the ceramic separator, since the PO separator was not wetted at all by these ionic liquids. Figs. 1-3 are based on Examples 2-4, described in the specification. Example 4 compares the wetting behavior of 2-ethyl-3-methyl-2-oxazolinium methylsulfate on a commercially available PP/PE/PP separator (Celgard 2500) vs. a ceramic separator according to the present invention.

Moreover, it is submitted that one skilled in the art would have interpreted the above-referenced disclosure of non-limiting examples of separator materials to those within the universe of natural and synthetic polymeric or organic materials, and glass fiber-based materials, and not to all materials ever disclosed for such utility.

In the Final Rejection, in response to the above arguments, the Examiner finds

The combination of the prior art is proper because Hennige discloses a process for producing a separator, utilized within a lithium battery, Maruo discloses an ionic liquids [sic], that are utilized in a secondary cell comprising lithium containing oxide cathode and carbonaceous anodes, that provide a lithium secondary battery with improvements in the cycle life and stability. See paragraph 60 and 119.



In reply, this finding is simply tantamount to a repetition of the Examiner's rationale for the holding of obviousness. However, it does not reply to any of the above-discussed arguments which were, in essence, made in the amendment filed March 12, 2009. Moreover, while as discussed above, Maruo et al discloses "non-limiting" examples of separator materials, all listed are organic in composition except glass fiber sheet [0141] and all the exemplified separator materials are organic, either polyolefins or cellulose, and for Example 11, polyurethane. Indeed, the universe of separator materials, pointing to organic materials, is so large that there is no *prima facie* case of obviousness herein. Compare *In re Baird*, 16 F.3d 380, 29 USPQ2d 1550 (Fed. Cir. 1994).

For all the above reasons, it is respectfully requested that the rejection be REVERSED.

Ground (B)

Claims 24 and 25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Hennige et al in view of Maruo et al, and further in view of Yoshioka et al. The rejection is untenable and should not be sustained.

Yoshioka et al has been relied on for a disclosure impregnating a separator with electrolyte composition after the separator has been installed in a battery. The disclosures and deficiencies of Hennige et al combined with Maruo et al have been discussed above under Ground (A). Yoshioka et al does not remedy these deficiencies.

For all the above reasons, it is respectfully requested that the rejection be REVERSED.

Application No. 11/578,664  
Appeal Brief

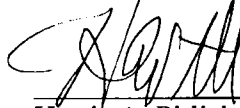
VIII. CONCLUSION

For the above reasons, it is respectfully requested that the rejections be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

Norman F. Oblon



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NFO:HAP\

CLAIMS APPENDIX

Claim 1. A method comprising installing a separator in a battery, wherein the separator has a ceramic surface and which comprises a sheetlike flexible substrate which has a multiplicity of openings and a coating present on and in this substrate, the material of the substrate being selected from woven or non-woven nonelectroconductive natural or polymeric fibers and the coating being a porous electroinsulating ceramic coating, the separator being filled with an electrolyte composition comprising a conducting salt and a base component, the main constituent of the base component, at a fraction of greater than 50% by mass, being at least one ionic liquid having a melting point of less than 100°C, and wherein the separator is filled with the electrolyte either before or after the separator is installed in the battery.

Claim 2. The method according to claim 1, wherein the battery is a lithium-metal or lithium-ion battery.

Claim 23. A process for producing a separator comprising providing a sheetlike flexible substrate which has a multiplicity of openings being provided with a coating in and on the substrate, applying a suspension which comprises particles of at least one inorganic compound suspended in a sol to the substrate and heating to solidify the suspension on and in the carrier, wherein the separator thus prepared is impregnated with an electrolyte composition comprising a conducting salt and a base component, the main constituent of the base component, at a fraction of greater than 50% by mass, being at least one ionic liquid having a melting point of less than 100°C.

Claim 24. A process according to claim 23, wherein the impregnating step is carried out at room temperature.

Claim 25. A process according to claim 23, wherein the separator is initially installed in a battery and subsequently the battery is filled with electrolyte, whereby the separator is impregnated with the electrolyte composition.

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Appeal Brief

EVIDENCE APPENDIX

None.

Application No. 11/578,664  
Appeal Brief

RELATED PROCEEDINGS APPENDIX

None.

DOCKET NO: 265368US0X PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
VOLKER HENNIGE, ET AL. : EXAMINER: RHEE, J. J.  
SERIAL NO: 10/524,665 :  
FILED: FEBRUARY 11, 2005 : GROUP ART UNIT: 1795  
FOR: SEPARATOR-ELECTRODE UNIT :  
FOR LITHIUM-ION BATTERIES,  
METHOD FOR THE PRODUCTION AND  
USE THEREOF IN LITHIUM BATTERIES

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated April 14, 2008 of Claims 1-12 and 30-31. A Notice of Appeal is **submitted herewith**.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Creavis Gesellschaft fuer Tech. und Innovation, having an address at Paul-Baumann-Strasse 1, Marl, Germany, 45722.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### III. STATUS OF THE CLAIMS

Claims 1-12 and 30-31 stand rejected and are herein appealed. Claims 13-28 stand withdrawn from consideration. Claim 29 has been canceled.

### IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed.

### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A summary of the claimed subject matter, as claimed in independent Claim 1, is mapped out below, with reference to page and line numbers in the specification added in **[bold]** after each element.

A separator-electrode unit **[4:8-9]** capable of functioning in a lithium battery as a separator-electrode unit **[4:28-30]**, the unit comprising a porous electrode and a separator layer applied to said porous electrode, **[4:9-12]** wherein the separator-electrode unit comprises an inorganic separator layer which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal, **[4:12-16]** the separator layer comprising metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode that are adhered together by metal oxide particles having an average particle size ( $D_k$ ) which is smaller than the pores of the porous electrode. **[10:5-11]**

### VI. GROUNDS OF REJECTION

Claims 1-12, 30 and 31 stand rejected under 35 U.S.C. § 103(a) as unpatentable over US 6,287,720 (Yamashita et al) in view of US 6,299,778 (Penth et al).



## VII. ARGUMENT

Claims 1-12, 30 and 31 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yamashita et al in view of Penth et al. The rejection is untenable and should not be sustained.

As recited in Claim 1, an embodiment of the present invention is a separator-electrode unit capable of functioning in a lithium battery as a separator-electrode unit, the unit comprising a porous electrode and a separator layer applied to said porous electrode, wherein the separator-electrode unit comprises an inorganic separator layer which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal, the separator layer comprising metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode that are adhered together by metal oxide particles having an average particle size ( $D_k$ ) which is smaller than the pores of the porous electrode.

The claims thus requires that the claimed separator-electrode unit be capable of functioning as a separator-electrode unit in a lithium battery; it necessarily follows that the terms “separator layer” and “electrode” are functional limitations of the claims.

Yamashita et al discloses a nonaqueous battery having a porous separator and a production method thereof (Abstract). The Examiner finds that the separator electrode unit of Yamashita et al comprises an inorganic separator layer, relying on the disclosure at column 6, line 59.

In reply, this disclosure is of the insulating substance of Yamashita et al's separator, which may be either an inorganic substance or an organic substance (column 6, lines 58-59). The battery of Yamashita et al requires an organic binder in the separator thereof (column 7, lines 56-65 and the Examples). While this disclosure states that it is “preferred” that the

separator further comprise a binder in order to bind the particles together, no other means is disclosed in Yamashita et al for such binding.

Penth et al is drawn to a catalytically active permeable composite material, method for producing the composite material, and use of the composite material. The composite material of Penth et al comprises a porous, permeable support or carrier in which a particular inorganic component is applied on at least one side of the support or carrier and inside the support or the carrier (column 2, lines 8-15).

While Penth et al discloses a number of utilities for their catalytically active-permeable composite material, use in a lithium battery is neither disclosed nor suggested. Indeed, the only disclosure of an anode or a cathode is that the composite of Penth et al can be used as a catalyst carrier, whereby the catalyst carrier has an electric field connected to it and the catalyst carrier is connected as an anode or cathode (column 11, lines 13-17). Clearly, Penth et al does not disclose the types of materials that would be used for electrodes in lithium batteries, such as disclosed in the specification herein at page 12, line 3 through page 13, line 16.

In the Final Rejection, in response to Applicants' argument that one skilled in the art would not look to the battery art to solve any problem associated with Penth et al, the Examiner finds that Penth et al "teaches components of a battery such as cathode, anode and separator," relying on the disclosure at column 11, lines 26-29 and column 1, line 22, and concludes that one of ordinary skill in the art "would associate theses [sic] components with a battery. Especially since Penth et al. teaches that by connecting the composite as a cathode, the catalytically reductive effect of the composite can be used and by connecting the composite as an anode the catalytically oxidative effect of the composite can be used."

In reply, the fact that the words cathode and anode are mentioned in Penth et al is irrelevant. The Examiner ignores the context in which these terms are used, as discussed

above. Indeed, the term “catalytic” appears throughout Penth et al’s disclosure, emphasizing the fact that the composite material of Penth et al is directed to carrying out processes in which the catalytic activity of the composite material is implicated. There is neither disclosure nor suggestion that the catalytically active composite materials of Penth et al would have any utility in combination with an electrode to form a separator-electrode unit capable of functioning in a lithium battery as a separator-electrode unit.

In response to Applicants’ argument that since Yamashita et al requires an organic binder in the separator, one skilled in the art would not have combined Yamashita et al and Penth et al, the Examiner finds that Yamashita et al “teaches a separator comprising inorganic particles and a binder in the amount of 1/500 to 5/3, therefore can be defined as an inorganic separator because the separator can consist of mostly inorganic particles and because the applicant claimed that the inorganic separator *comprises* at least two fractions of metal oxide particles that differ from each other in particle size or in the metal which is not limited to consisting only metal oxide particles.”

In reply, that Applicants employ the term “comprises” in the claims, meaning that the separator-electrode unit can include other components, does not negate the fact that Claim 1 recites that the separator-electrode unit comprise “an inorganic separator layer.” The term “an inorganic separator layer” necessarily excludes the presence of organic materials. The ratio range of inorganic particles to binder in Yamashita et al (paragraph bridging columns 7 and 8) does not change this fact, even though in terms of volume ratio, the particles may have a volume ratio to binder of 500/1.

#### Claims 7-9

Claims 7-9 are separately patentable. These claims require that the separator layer comprise a coating with shutdown particles which melt at a desired shutdown temperature.

Yamashita et al discloses and suggests nothing with regard to a coating as part of their separator layer, let alone a coating with particles having the capability of performing a shutdown function. The Examiner's citations refer to the particles of the insulating substance of Yamashita et al, and not a separate coating.

Claim 11

Claim 11 is separately patentable. The catalytically active permeable composite material of Penth et al is disclosed as obtainable from a wide variety of particular materials and amounts thereof. There is no reason to conclude that regardless of the particular materials and amounts used that the resulting composite material would be bendable down to a radius of 50 cm without damage.

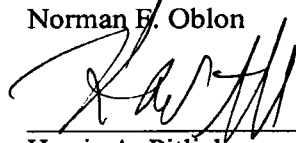
For all the above reasons, it is respectfully requested that this rejection be REVERSED.

VIII. CONCLUSION

For the above reasons, it is respectfully requested that the rejections be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.  
Norman E. Oblon



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NFO:HAP\

CLAIMS APPENDIX

Claim 1: A separator-electrode unit capable of functioning in a lithium battery as a separator-electrode unit, the unit comprising a porous electrode and a separator layer applied to said porous electrode, wherein the separator-electrode unit comprises an inorganic separator layer which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal, the separator layer comprising metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode that are adhered together by metal oxide particles having an average particle size ( $D_k$ ) which is smaller than the pores of the porous electrode.

Claim 2: A separator-electrode unit according to claim 1, wherein the separator layer has a thickness ( $z$ ) which is less than  $100 D_g$  and not less than  $1.5 D_g$ .

Claim 3: A separator-electrode unit according to claim 1, wherein the separator layer has a thickness ( $z$ ) which is less than  $20 D_g$  and not less than  $5 D_g$ .

Claim 4: A separator-electrode unit according to claim 1, wherein the metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode are  $Al_2O_3$  and/or  $ZrO_2$  particles.

Claim 5: A separator-electrode unit according to claim 1, wherein the metal oxide particles having an average particle size ( $D_k$ ) which is smaller than the average pore size ( $d$ ) of the pores of the porous electrode are  $SiO_2$  and/or  $ZrO_2$  particles.

Claim 6: A separator-electrode unit according to claim 1, wherein the metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode have an average particle size ( $D_g$ ) of less than 10  $\mu\text{m}$ .

Claim 7: A separator-electrode unit according to claim 1, wherein the separator layer comprises a coating with shutdown particles which melt at a desired shutdown temperature.

Claim 8: A separator-electrode unit according to claim 7, wherein the shutdown particles have an average particle size ( $D_w$ ) which is not less than the average pore size ( $d_s$ ) of the pores of the porous separator layer.

Claim 9: A separator-electrode unit according to claim 7, wherein the shutdown particle layer has a thickness ( $z_w$ ) which ranges from about equal to the average particle size of the shutdown particles ( $D_w$ ) up to 10  $D_w$ .

Claim 10: A separator-electrode unit according to claim 1, wherein the separator layer has a porosity of from 30 to 70%.

Claim 11: A separator-electrode unit according to claim 1, wherein the unit is bendable down to a radius of 50 cm without damage.

Claim 12: A separator-electrode unit according to claim 1, wherein the electrode is an electrode which is capable of functioning as a positive electrode (cathode) or as a negative electrode (anode).

Claim 30: A lithium battery comprising said separator-electrode unit according to claim 1.

Claim 31: A method for making a lithium battery, said method comprising:  
incorporating said separator-electrode unit according to claim 1 in a battery comprising lithium to obtain said lithium battery.

Application No. 10/524,665  
Appeal Brief

EVIDENCE APPENDIX

None.



Application No. 10/524,665  
Appeal Brief

RELATED PROCEEDINGS APPENDIX

None.



# UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,665	02/11/2005	Volker Hennige	265368US0XPCT	1535
22850 7590 09/05/2008 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER RHEE, JANE J	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 09/05/2008	DELIVERY MODE ELECTRONIC

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/524,665  
Filing Date: February 11, 2005  
Appellant(s): HENNIGE ET AL.

Oblon, Spivak, McClelland, Maier and Neustadt P.C.  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 7/7/08 appealing from the Office action mailed 4/14/08.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

6287720	Yamashita et al.	9-2001
6299778	Penth et al.	10-2001

**(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

1. Claims 1-12,30-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamashita et al. in view of Penth et al. (6299778).

As to claims 1,30-31 Yamashita et al. discloses a separator electrode unit capable of function in a lithium battery as a separator electrode unit, the unit comprising a porous electrode and a separator layer applied to the porous electrode (col. 8 lines 5-9), wherein the separator electrode unit comprises an inorganic separator layer (col. 6 lines 59).

Yamashita et al. fail to disclose wherein the inorganic separator layer comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal the separator layer comprising metal oxide particles having an average particle size (D.sub.g) which is greater than the average pore size (d) of the pores of the porous electrode that are adhered together by metal oxide particles having a particle size (D.sub.k) which is smaller than the pores of the porous positive electrode.

Penth et al. teaches an inorganic separator layer which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal (col. 5 lines 1-7), the separator layer comprising metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode (col. 4 lines 65-67 and col. 4 lines 16-17) that are adhered together by metal oxide particles having a particle size ( $D_{sub.k}$ ) which is smaller than the pores of the porous positive electrode (col. 4 lines 65-67, col. 4 lines 16-17) for the purpose of providing a permeable composite that can be produced simply at a reasonable price (col. 2 lines 3-15).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Yamashita et al. with an inorganic separator that comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal the separator layer comprising metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode that are adhered together by metal oxide particles having a particle size ( $D_{sub.k}$ ) which is smaller than the pores of the porous positive electrode in order to provide a separator that can be produced simply at a reasonable price.

As to claim 2, Penth et al. teaches wherein the separator layer has a thickness ( $z$ ) which is less than  $100 D_{sub.g}$  and not less than  $1.5 D_{sub.g}$  (col. 7 lines 36-38).

As to claim 3, Penth et al. teaches wherein the separator layer has a thickness ( $z$ ) which is less than  $20 D_{sub.g}$  and not less than  $5 D_{sub.g}$  (col. 7 lines 36-38)

As to claim 4, Penth et al. teaches wherein the metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous positive electrode are  $Al_{sub.2}O_{sub.3}$  and/or  $ZrO_{sub.2}$  particles (col. 4 line 54).

As to claim 5, Penth et al. teaches wherein the metal oxide particles having an average particle size ( $D_{sub.k}$ ) which is smaller than the average pore size ( $d$ ) of the pores of the porous positive electrode are  $SiO_{sub.2}$  and/or  $ZrO_{sub.2}$  particles (col. 4 line 54).

As to claim 6, Penth et al. teaches, wherein the metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous positive electrode have an average particle size ( $D_{sub.g}$ ) of less than 10  $\mu m$  (col. 4 line 67).

As to claim 11, wherein the unit is bendable down to a radius of 50 cm without damage, since Penth et al. teaches the same material for the separator-electrode unit desired by the applicant, it is inherent that the unit is bendable down to a radius of 50 cm without damage.

Penth et al. teaches separator electrode unit described above for the purpose of providing a catalytically active composite that can be produced in a simple and economical process (col. 2 lines 3-7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Yamashita et al. with the separator layer has a thickness ( $z$ ) which is less than 100  $D_{sub.g}$  and not less than 1.5  $D_{sub.g}$ , a

thickness (z) which is less than  $20 D_{sub.g}$  and not less than  $5 D_{sub.g}$ , wherein the metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size (d) of the pores of the porous positive electrode are  $Al_{sub.2}O_{sub.3}$  and/or  $ZrO_{sub.2}$ , wherein the metal oxide particles having an average particle size ( $D_{sub.k}$ ) which is smaller than the average pore size (d) of the pores of the porous positive electrode are  $SiO_{sub.2}$  and/or  $ZrO_{sub.2}$  particles, wherein the metal oxide particles having an average particle size ( $D_{sub.g}$ ) which is greater than the average pore size (d) of the pores of the porous positive electrode have an average particle size ( $D_{sub.g}$ ) of less than  $10 \mu m$  and wherein the unit is bendable down to a radius of 50 cm without damage in order to provide a catalytically active composite that can be produced in a simple and economical process (col. 2 lines 3-7) as taught by Pentth et al.

As to claims 7-10, Yamashita et al. discloses a battery wherein the separator layer comprises a coating with shutdown particles which melt at a desired shutdown temperature (col. 5 lines 24-34), wherein the shutdown particles have an average particle size ( $D_{sub.w}$ ) which is not less than the average pore size ( $d_{sub.s}$ ) of the pores of the porous separator layer (col. 7 lines 47-51) and that the shutdown particle layer has a thickness ( $z_{sub.w}$ ) which ranges from about equal to the average particle size of the shutdown particles ( $D_{sub.w}$ ) up to  $10 D_{sub.w}$  (col. 7 lines 52-55) and wherein the separator layer has a porosity of from 30 to 70% (col. 8 lines 32-35).

#### **(10) Response to Argument**



In response to appellant's argument that since Yamashita et al. requires an organic binder in the separator, the combination of Yamashita et al. and Penth et al. would not present the presently claimed invention which requires an inorganic separator layer, Yamashita et al. teaches a separator comprising inorganic particles and a binder in the amount of 1/500 to 5/3, therefore can be defined as an inorganic separator because the separator can consist of mostly inorganic particles and because the applicant claimed that the inorganic separator *comprises* at least two fractions of metal oxide particles that differ from each other in particle size or in the metal which is not limited to consisting only metal oxide particles. Furthermore, Yamashita et al. discloses that it is preferred that the separator comprises a binder and not required (col. 7 line 56).

In response to appellant's argument that since Penth et al. discloses and suggest nothing about a lithium battery, one skilled in the art would not look to the battery art to solve any problem associated with Penth et al., Penth et al. teaches components of a battery such as cathode, anode and separator (col. 11 lines 26-29 and col. 1 line 22) therefore one skilled in the art would associate theses components with a battery. Especially since Penth et al. teaches that by connecting the composite as a cathode, the catalytically reductive effect of the composite can be used and by connecting the composite as an anode the catalytically oxidative effect of the composite can be used.

In response to appellant's argument that there is neither disclosure nor suggestion that the catalytically active composite material of Penth et al. would have any utility in combination with electrode to form a separator electrode unit capable of

functioning in a lithium battery as a separator electrode unit, Penth teaches that the composite material can be used as a catalytically active membrane electrode (abstract) thus the composite material would have utility in combination with electrode capable of functioning in a lithium battery.

In response to appellant's argument that Yamashita et al. suggest nothing with regard to a coating as part of their separator layer, let alone a coating with particles having the capability of performing a shutdown function, Yamashita et al. discloses at least one layer of an aggregate form of particles of at least one insulating substance, therefore there can be two layers of particles on the separator wherein one layer can be considered the coating with particles having the capability of performing a shutdown function since Yamashita et al. discloses the same particles desired by the applicant to perform the shutdown function.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jane Rhee/

Examiner, Art Unit 1795

Conferees:

Patrick Ryan

Application/Control Number: 10/524,665  
Art Unit: 1795

Page 9

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

William Krynski

/William Krynski/

Quality Assurance Specialist, TC 1700



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,665	02/11/2005	Volker Hennige	265368US0XPCT	1535
22850 7590 02/01/2010 OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER RHEE, JANE J	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 02/01/2010	DELIVERY MODE ELECTRONIC

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* VOLKER HENNINGE, CHRISTIAN HYING,  
GERHARD HORPEL, and SVEN AUGUSTIN

Appeal 2009-011171  
Application 10/524,665  
Technology Center 1700

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Decided: January 28, 2010

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Before BRADLEY R. GARRIS, CHARLES F. WARREN, and  
TERRY J. OWENS, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1-12, 30, and 31 in the Office Action mailed April 14, 2008. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2008).

An oral hearing was held January 21, 2008.

We reverse the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a separator-electrode unit capable of functioning in a lithium battery as a separator-electrode unit, and is representative of the claims on appeal:

1. A separator-electrode unit capable of functioning in a lithium battery as a separator-electrode unit, the unit comprising a porous electrode and a separator layer applied to said porous electrode, wherein the separator-electrode unit comprises an inorganic separator unit which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal, the separator layer comprising metal oxide particles having an average particle size ( $D_g$ ) which is greater than the average pore size ( $d$ ) of the pores of the porous electrode that are adhered together by metal oxide particles having an average particle size ( $D_k$ ) which is smaller than the pores of the porous electrode.

The Examiner relies upon the evidence in these references (Ans. 2):

Yamashita	US 6,287,720 B1	Sep. 11, 2001
Penth	US 6,299,778 B1	Oct. 9, 2001

Appellants request review of the ground of rejection under 35 U.S.C. § 103(a) advanced on appeal by the Examiner: claims 1-12, 30, and 31 over Yamashita in view of Penth. App. Br. 2; Ans. 3.

#### Opinion

The dispositive issue entails the interpretation of the claim language “wherein the separator-electrode unit comprises an inorganic separator unit which comprises at least two fractions of metal oxide particles which differ from each other in their average particle size and/or in the metal, the separator layer comprising metal oxide particles . . . that are adhered together by metal oxide particles” of independent claim 1 by giving the terms thereof the broadest reasonable interpretation in their ordinary usage in context as they would be understood by one of ordinary skill in the art in light of the written description in the Specification. *See, e.g., In re ICON*

*Health and Fitness, Inc.*, 496 F.3d 1374, 1378-79 (Fed. Cir. 2007); *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004), and cases cited therein; *In re Morris*, 127 F.3d 1048, 1054-55 (Fed. Cir. 1997).

On this record, we agree with Appellants that the claim “term ‘an inorganic separator layer’ necessarily excludes the presence of organic materials” in the separator. App. Br. 5. Indeed, we find no basis in the language of the appealed claims or in the Specification to interpret the term “inorganic separator layer” in claim 1 as including “organic” ingredients. *See Spec.*, e.g., 3-7. We further note, in this respect, that claim 1 includes the requirement “the separator layer comprising metal oxide particles . . . that are adhered together by metal oxide particles.” Thus, in view of the explicit claim requirement that the separator layer is “inorganic,” we further agree with Appellants that, contrary to the Examiner’s position, the open-ended terms “comprises” and “comprising” in claim 1 do not open claim 1 to include a separator-electrode unit which has “an inorganic separator layer” that includes “organic” ingredients. App. Br. 5; Ans. 7. *See In re Skvorecz*, 580 F.3d 1262, 1267 (Fed. Cir. 2009), and case cited therein (the term comprising “simply means that the device may contain elements in addition to those explicitly mentioned in the claim”).

We agree with Appellants that Yamashita’s separators are prepared with an organic binder and thus, an “organic” ingredient. Ans. 7. In this respect, as Appellants point out and contrary to the Examiner’s position, one of ordinary skill in this art would not have interpreted the term “preferred” in the phrase “it is preferred that the porous separator further comprises a binder in order to bind the particles together,” among other things, inorganic

particles, in Yamashita to describe a separator that does not include an organic binder when the language is considered in light of Yamashita's disclosure taken as a whole. App. Br. 3-4; Ans. 7. Indeed, we find Yamashita clearly requires a binder to maintain the porous structure of the separator. Yamashita, e.g., col. 3, ll. 30-35, col. 4, l. 20 to col. 5, l. 4, and col. 5, ll. 24-35. We further find that Yamashita's separator can have, among other things, a ratio of organic binder to inorganic particles of 1/500, as the Examiner points out. Ans. 7. Yamashita col. 7, l. 56 to col. 8, l. 4. We cannot subscribe to the Examiner's position that a separator so constituted "can be defined as an inorganic separator because the separator can consist of mostly inorganic particles" because of the presence of an "organic" binder, as Appellants argue. Ans. 7; App. Br. 5. In these respect, we noted above the claim requirement that the separator layer includes metal oxide particles adhered together by metal oxide particles.

On this record, the Examiner has not adduced scientific reasoning or evidence establishing that one of ordinary skill in this art would have modified Yamashita's separators by eliminating the organic binder, thus resulting in an "inorganic" separator as claimed in claim 1. Thus, the Examiner has not established that the combined teachings of Yamashita and Penth provide the factual foundation for a conclusion of prima facie obviousness under § 103(a). *See, e.g., In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992); *In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967).

Accordingly, in the absence of a prima facie case of obviousness, we reverse the ground of rejection of the appealed claims under 35 U.S.C. § 103(a).



Appeal 2009-011171  
Application 10/524,665

The Primary Examiner's decision is reversed.

REVERSED

tc

OBLON SPIVAK MCCLELLAND MAIER & NEUSTADT, L.L.P.  
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ALEXANDRIA, VA 22314

DOCKET NO: 265368US0X PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
VOLKER HENNIGE, ET AL. : EXAMINER: RHEE, J. J.  
SERIAL NO: 10/524,665 :  
FILED: FEBRUARY 11, 2005 : GROUP ART UNIT: 1795  
FOR: SEPARATOR-ELECTRODE UNIT :  
FOR LITHIUM-ION BATTERIES,  
METHOD FOR THE PRODUCTION AND  
USE THEREOF IN LITHIUM BATTERIES

REPLY BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

The following Reply Brief is in reply to the Examiner's Answer dated September 5, 2008 (Answer).

The statement of the Grounds of Rejection (Answer at 3-6), as well as the first two paragraphs in the Response to Argument, except for the last sentence of the first paragraph (Answer at 7), are identical to the statement and responses in the Final Rejection, which have already been responded to in the Appeal Brief. Thus, the following is in reply to said sentence, and the two paragraphs following the first two paragraphs in the Response to Argument (Answer at 7-8).

The Examiner finds that the binder is disclosed as preferred and thus not required in Yamashita et al (Answer at 7). In reply, Applicants have already responded to this finding in the Appeal Brief, noting that no other means besides a binder is disclosed in Yamashita et al for binding their particles together.

In response to Applicants' argument that there is neither disclosure nor suggestion in Penth et al that their catalytically active permeable composite material would have any utility in combination with an electrode to form a separator electrode unit capable of functioning in a lithium battery as a separator electrode unit, the Examiner finds that Penth et al "teaches that the composite material can be used as a catalytically active membrane electrode (abstract) thus the composite material would have utility in combination with electrode capable of functioning in a lithium battery" (Answer at 8).

In reply, this finding has essentially been responded to in the Appeal Brief.

In response to Applicants' argument with regard to the separate patentability of Claims 7-9 that Yamashita et al suggests nothing with regard to a coating as part of their separator layer, let alone a coating with particles having the capability of performing a shut down function, the Examiner finds that "Yamashita et al. discloses at least one layer of an aggregate form of particles of at least one insulating substance, therefore there can be two layers of particles on the separator wherein one layer can be considered the coating with particles having the capability of performing a shutdown function since Yamashita et al. discloses the same particles desired by the applicant to perform the shutdown function" (Answer at 8).

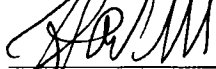
In reply, and as already responded to in the Appeal Brief, the particles of the insulating substance are not a separate coating.

Applicants continue to maintain that the rejection should be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

Norman F. Oblon



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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
VOLKER HENNIGE, ET AL. : EXAMINER: RHEE, J. J.  
SERIAL NO: 10/524,143 :  
FILED: FEBRUARY 11, 2005 : GROUP ART UNIT: 1795  
FOR: ELECTRIC SEPARATOR, :  
PRODUCTION THEREOF AND USE IN  
LITHIUM HIGH POWER BATTERIES

APPEAL BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

This is an appeal of the Final Rejection dated April 14, 2008 of Claims 1-12 and 24-25. A Notice of Appeal is **submitted herewith**.

I. REAL PARTY IN INTEREST

The real party in interest in this appeal is Creavis Gesellschaft fuer Tech. und Innovation, having an address at Paul-Baumann-Strasse 1, Marl, Germany, 45722.

II. RELATED APPEALS AND INTERFERENCES

Appellants, Appellants' legal representative and the assignee are aware of no appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

### III. STATUS OF THE CLAIMS

Claims 1-12 and 24-25 stand rejected and are herein appealed. Claims 13-23 stand withdrawn from consideration.

### IV. STATUS OF THE AMENDMENTS

No amendment under 37 CFR 1.116 has been filed.

### V. SUMMARY OF THE CLAIMED SUBJECT MATTER

A summary of the claimed subject matter, as claimed in independent Claim 1, is mapped out below, with reference to page and line numbers in the specification added in **[bold]** after each element.

A separator, **[5:6]** comprising a flexible nonwoven having a porous inorganic coating on and in said nonwoven, **[5:7-8]** and wherein the material of said nonwoven is selected from non-woven, nonelectroconductive polymeric fibers, **[5:8-10]** and wherein said nonwoven has a thickness of less than 30  $\mu\text{m}$ , a porosity of more than 50% and a pore radius distribution, in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ . **[5:11-14]**

### VI. GROUNDS OF REJECTION

#### Ground (A)

Claims 1-6, 9-12, and 24-25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over US 6,495,292 (Yen) in view of JP 10-326607 (Omae et al).

#### Ground (B)

Claims 7-8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yen in view of Omae et al, and further in view of US 5,389,471 (Kung).

Ground (C)

Claims 1-12 and 24-25 stand rejected on the ground of nonstatutory obviousness-type double patenting over Claims 1-12 of copending Application No. 10/504,144 (copending application) in view of Omae et al.

VII. ARGUMENT

Ground (A)

Claims 1-6, 9-12, and 24-25 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yen in view of Omae et al. The rejection is untenable and should not be sustained.

As recited in Claim 1, an embodiment of the present invention is a separator, comprising a flexible nonwoven having a porous inorganic coating on and in said nonwoven, and wherein the material of said nonwoven is selected from non-woven, nonelectroconductive polymeric fibers, and wherein said nonwoven has a thickness of less than 30  $\mu\text{m}$ , a porosity of more than 50% and a pore radius distribution, in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ .

Yen discloses a nonwoven battery separator which comprises a nonwoven, the nonwoven formed from a plurality of fibers and at least one high solubility parameter polymer, which polymer forms an encapsulation sheath around the fibers, which encapsulation sheath optionally has pores of about one micron or less and the separator has a surface pore size of at least five microns (column 1, lines 61-67). Yen discloses further that inorganic fillers can be added as part of the encapsulation sheath to improve the wettability of the nonwoven, in a particularly preferable range of between 0 and 50% by weight (column 2, lines 48-56). The encapsulation sheath around the fiber has a thickness of less than five

microns (column 3, lines 54-55), and the separator has a thickness of 1 to 50 mils (column 3, line 67), which is equivalent to 25-1250 microns.

The Examiner finds that Yen fails to disclose pore radius distributions in which at least 50% of the pores have a pore radius of from 75 to 150  $\mu\text{m}$ . The Examiner thus relies on Omae et al. Omae et al discloses a battery separator based on a sea-island type composite fiber formed from a polyamide resin-based sea component and a polypropylene-based island component, which composite fiber is mixed with olefin series fibers as a binder so as to form a hybrid fiber, and a cloth web thus obtained is subjected to a water stream entangling process, followed by a sulfonating process, resulting in a battery separator whose maximum pore diameter ranges between 25 and 150  $\mu\text{m}$  (English Abstract).

Finding that Omae et al discloses a nonwoven separator with a pore radius of 75  $\mu\text{m}$ , relying on paragraph [0006] therein (which discloses 25-150  $\mu\text{m}$ , not 75  $\mu\text{m}$ ), the Examiner holds that it would have been obvious to one of ordinary skill in the art to employ such a pore radius in the separator of Yen, in order to obtain excellent solution retention and absorbency, relying on paragraph [0004] of Omae et al.

In reply, it is not clear why one skilled in the art would have combined Yen and Omae et al, but even if combined, the result would not be the presently claimed invention. The present invention requires, *inter alia*, that the inorganic coating be porous. Yen does not disclose a porous inorganic coating. Rather, Yen discloses an encapsulation sheath of at least one high solubility parameter polymer, which is optionally porous and which optionally contains an inorganic filler, but the encapsulation sheath cannot be characterized as inorganic. In addition, the Examiner unjustifiably assumes that the excellent solution retention and absorbency disclosed by Omae et al is due to the disclosed maximum pore diameter range therein of between 25 and 150  $\mu\text{m}$ , as opposed to all the other characteristics of their battery separator, as discussed above. In addition, while such a maximum pore diameter range is

beneficial for Omae et al, it is not clear that one of ordinary skill in the art would extrapolate such a pore diameter range to a separator as disclosed by Yen, which does not resemble that of Omae et al.

Thus, a *prima facie* case of obviousness has not been made out. Nevertheless, Applicants have described comparative data in the specification that is probative of non-obviousness, as now discussed.

(Comparative) Example 1 describes a so-called S450PET separator, having an average pore size of 450 nm, a thickness of about 50  $\mu\text{m}$ , and a porosity of about 47% ([0089]-[0091]). Example 3 describes a so-called S850PET separator, having an average pore size of 865 nm, a thickness of 30  $\mu\text{m}$ , and a porosity of about 53% ([0095]-[0097]). (Comparative) Example 4, using the S450PET separator ([0098]-[0099]), and Example 5, using the S850PET separator ([0100]-[0102]), were compared with regard to charging and discharging when used in a lithium ion battery. Using the comparative S450PET separator, on discharging the battery at C (about 3  $\text{mA}/\text{cm}^2$ ), it is found that at these high currents it is impossible to discharge the entire capacity, which is attributable to the internal resistance which is still too high ([0099]). However, with regard to the inventive S850PET separator, on discharging the battery at C (about 3  $\text{mA}/\text{cm}^2$ ), it was found that virtually the entire capacity of the battery can be discharged at these high currents, which is attributable to higher porosity, lower thickness, larger pore size and hence lower internal resistance compared with that of (Comparative) Example 4 ([0102]).

(Comparative) Example 4, although outside the terms of the present claims, is closer than any of the prior art relied on by the Examiner. Compare *Ex parte Humber*, 217 USPQ 265 (Bd. Pat. App. & Inter. 1981) (comparative data showing the claimed chlorine-containing compounds to be unexpected over various (non-prior art) chlorine-containing isomers was



accepted as more probative over prior art, drawn to non-chlorine containing analogs of the claimed compounds, asserted to be closest.)

In the Final Rejection, in response to Applicants' argument that Yen does not disclose a porous inorganic coating, the Examiner finds that Yen "teaches inorganic fillers that are added as part of the encapsulation sheath to improve the wettability of the nonwoven thus the inorganic fillers are considered the inorganic coating because the inorganic fillers is on and in the nonwoven material as desired by applicant's claim 1."

In reply, that Yen's encapsulation sheath may optionally contain inorganic fillers does not make the encapsulation sheath inorganic since, as discussed above, the sheath must contain at least one high solubility parameter polymer. No inorganic polymers are disclosed or suggested.

In response to Applicants' argument that there is no suggestion to combine Yen and Omae et al, the Examiner cites *In re Fine* (citation omitted) and *In re Jones* (citation omitted)), and essentially repeats her previous conclusion of obviousness. Applicants do not disagree with the precedent of *Fine* and *Jones* herein but they are inapposite, for reasons above stated. In addition, the Examiner's response includes no response to Applicants' argument of unjustifiable assumption by the Examiner that the excellent solution retention and absorbency disclosed by Omae et al is due to their disclosed maximum pore diameter range, as opposed to all the other characteristics of their battery separator. Nor does the Examiner respond to Applicants' argument that while such a maximum pore diameter range is beneficial for Omae et al, it is not clear that one of ordinary skill in the art would extrapolate such a pore diameter range to a separator as disclosed by Yen, which does not resemble that of Omae et al. Nor does the Examiner respond to Applicants' argument regarding the comparative data herein.

Claim 9

Claim 9 is separately patentable. Yen does not disclose any porosity for his separator. The Examiner's citation to column 2, line 67 of Yen refers to the wet porosity of a cellophane material disclosed as an exemplary material for the encapsulation sheath therein, not the battery separator *per se*.

Claim 10

Claim 10 is separately patentable. The Examiner finds that the recited breaking strength is inherent in Yen. However, there is no basis for the Examiner finding such inherency, given the other differences, as discussed above, between the presently-claimed separator and that of Yen.

Claims 11 and 12

Claims 11 and 12 are separately patentable. The Examiner finds that the recited bendable limitation is inherent in Yen. However, there is no basis for the Examiner finding such inherency, given the other differences, as discussed above, between the presently-claimed separator and that of Yen.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

Ground (B)

Claims 7-8 stand rejected under 35 U.S.C. § 103(a) as unpatentable over Yen in view of Omae et al, and further in view of Kung. The rejection is untenable and should not be sustained.

The disclosures and deficiencies of Yen combined with Omae et al have been discussed above. Kung does not remedy these deficiencies.

The Examiner relies on Kung as disclosing oxide particles. However, the oxide particles in Kung are optional inorganic alkali resistant fillers (column 4, line 42ff) in a wettable battery separator for alkaline batteries comprising a porous sheet selected from the group consisting of microporous films, fabrics and synthetic papers, wherein the sheet is saturated with the resin containing one or more carboxyl groups which have been neutralized with a base so as to form a salt wherein the resin is present in an amount of from about 0.0001 to 3% by weight of the sheet (column 2, lines 23-31 and Claim 1). In effect, Kung does not remedy any of the above-discussed deficiencies in the combination of Yen and Omae et al. Indeed, the optional inorganic alkali resistant fillers of Kung are not part of a coating but are present in the separator *per se*. Thus, even if one of ordinary skill in the art were to combine Kung with Yen and Omae et al, the fillers of particle size disclosed by Kung would not be part of a coating.

In the Final Rejection, in response to Applicants' arguments regarding Kung, the Examiner cites the *Fine* and *Jones* cases again, and holds that it would be obvious to use a particle size within the range of presently-recited Claim 7 for the oxide particles of Yen "in order to provide a separator that is excellent in tensile strength, wicking properties, wettability and alkali resistance."

In reply, since the optional inorganic fillers, added to the encapsulation sheath, of Yen are present for a different purpose than the optional inorganic alkali resistant fillers of Kung, any rationale for combining these disparate disclosures is incongruous.

Claim 8

Claim 8 is separately patentable because none of the applied prior art discloses aluminum oxide particles of any average particle size, let alone that recited in the claim, adhered by an oxide of Zr or Si.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

Ground (C)

Claims 1-12 and 24-25 stand rejected on the ground of nonstatutory obviousness-type double patenting over Claims 1-12 of copending application in view of Omae et al. The rejection is untenable and should not be sustained.

While the Examiner speaks in terms of what the copending application discloses, the only relevant subject matter is the claims thereof. As admitted by the Examiner, the claims of the copending application recite nothing with regard to pore radius distributions in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ . Nor do the claims of the copending application require that their nonwoven thickness be less than 30  $\mu\text{m}$ , since Claim 2 thereof recites a maximum thickness of 80  $\mu\text{m}$ . The disclosures and deficiencies of Omae et al. have been discussed above. Omae et al. does not suggest that the particular maximum pore diameter range of between 25 and 150  $\mu\text{m}$  disclosed therein would have any applicability in a battery separator such as that claimed herein, which has no resemblance to the battery separator of Omae et al.

In addition, DE 10208277, which is from the same patent family as the copending application, is described in the specification herein, as not especially suitable for use in lithium high power batteries, since these batteries have to give off large currents within a very

short time at virtually constant voltage, and these separators do not meet the performance requirements of such separators for lithium high power batteries because they are insufficiently porous and too thick and hence still insufficiently ion-conductive ([0011]).

In the Final Rejection, the Examiner in essence simply repeats the conclusion of obviousness stated in the first Office Action, but does not respond to the above arguments. Indeed, the Examiner discusses Yen in this response, although Yen is not applied in the rejection.

For all the above reasons, it is respectfully requested that this rejection be REVERSED.

#### VIII. CONCLUSION

For the above reasons, it is respectfully requested that the rejections be REVERSED.

Respectfully submitted,

OBLON, SPIVAK, McCLELLAND,  
MAIER & NEUSTADT, P.C.

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CLAIMS APPENDIX

Claim 1. A separator, comprising a flexible nonwoven having a porous inorganic coating on and in said nonwoven, and wherein the material of said nonwoven is selected from non-woven, nonelectroconductive polymeric fibers, and wherein said nonwoven has a thickness of less than 30  $\mu\text{m}$ , a porosity of more than 50% and a pore radius distribution, in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ .

Claim 2. The separator of claim 1, wherein said separator is less than 35  $\mu\text{m}$  in thickness.

Claim 3. The separator of claim 1, wherein said polymeric fibers are selected from fibers of polyacrylonitrile, polyester, polyolefin or mixtures thereof.

Claim 4. The separator of claim 1, wherein said polymeric fibers are from 0.1 to 10  $\mu\text{m}$  in diameter.

Claim 5. The separator of claim 1, wherein said flexible nonwoven has a base weight of less than 20  $\text{g/m}^2$ .

Claim 6. The separator of claim 1, wherein said nonwoven is from 5 to 30  $\mu\text{m}$  in thickness.

Claim 7. The separator of claim 1, wherein said porous inorganic coating, present on and in said nonwoven, comprises oxide particles of the elements Al, Si and/or Zr having an average particle size from 0.5 to 7  $\mu\text{m}$ .

Claim 8. The separator of claim 1, wherein said porous inorganic coating, present on and in said nonwoven, comprises aluminum oxide particles having an average particle size from 1 to 4  $\mu\text{m}$ , which are adhered by an oxide of the elements Zr or Si.

Claim 9. The separator of claim 1, wherein said separator is from 30 to 80% in porosity.

Claim 10. The separator of claim 1, wherein said separator has a breaking strength of more than 1 N/cm.

Claim 11. The separator of claim 1, wherein said separator is bendable around a radius down to 100 mm without damage.

Claim 12. The separator of claim 1, wherein said separator is bendable around a radius down to 1 mm without damage.

Claim 24. A method of producing a battery, comprising, inserting the separator as claimed in claim 1 into a battery cell.

Claim 25. A battery comprising the separator as claimed in claim 1, and one or more components.

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EVIDENCE APPENDIX

None.



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RELATED PROCEEDINGS APPENDIX

None.



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OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER RHEE, JANE J	
			ART UNIT 1795	PAPER NUMBER
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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**BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES**

Application Number: 10/524,143  
Filing Date: February 11, 2005  
Appellant(s): HENNINGE ET AL.

Oblon, Spivak, McClelland, Maier and Neustadt, P.C.  
For Appellant

**EXAMINER'S ANSWER**

This is in response to the appeal brief filed 7/3/08 appealing from the Office action  
mailed 4/14/08.

**(1) Real Party in Interest**

A statement identifying by name the real party in interest is contained in the brief.

**(2) Related Appeals and Interferences**

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

**(3) Status of Claims**

The statement of the status of claims contained in the brief is correct.

**(4) Status of Amendments After Final**

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

**(5) Summary of Claimed Subject Matter**

The summary of claimed subject matter contained in the brief is correct.

**(6) Grounds of Rejection to be Reviewed on Appeal**

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

**(7) Claims Appendix**

The copy of the appealed claims contained in the Appendix to the brief is correct.

**(8) Evidence Relied Upon**

20050084761	Hennige et al.	04-2005
JP10326607	Omae et al.	12-1998
6495292	Yen	12-2002

5389471

Kung

2-1995

### **(9) Grounds of Rejection**

The following ground(s) of rejection are applicable to the appealed claims:

#### ***Double Patenting***

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

1. Claims 1-12,24-25 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-12 of copending Application No. 10504144 in view of Omae et al. (JP10326607).

Copending application '144 discloses a separator comprising a flexible nonwoven having a porous inorganic coating on and in the nonwoven, the material of the

nonwoven being selected from nonwoven nonelectroconductive polymeric fibers, characterized by the nonwoven having a thickness of less than 30um and a porosity of more than 50% (claims 1 and 7). Copending application fail to disclose that the pores have a pore radius from 75-150um.

Omea et al. teaches a nonwoven separator with a pore radius of 75 um (paragraph 0006 from English translation) for the purpose of being excellent in solution retention and absorbency (paragraph 0004).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Copending application '144 with a pore radius of 75um in order to be excellent in solution retention and absorbency as taught by Omea et al.

This is a provisional obviousness-type double patenting rejection.

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-6,9-12,24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yen (6495292) in view of Omea et al (JP10326607).

As to claim 1, Yen discloses separators comprising a flexible nonwoven (col. 2 line 17-30) having a porous inorganic coating on and in said nonwoven (col. 2 lines 50-56), and wherein the material of said nonwoven is selected from non-woven,

nonelectroconductive polymeric fibers (col. 2 line 17-30), and wherein said nonwoven has a thickness of less than 30 .mu.m, (col. 3 line 67) a porosity of more than 50% (col. 2 line 67).

Yen fail to disclose a pore radius distributions in which at least 50% of the pores have a pore radius from 75 to 150 .mu.m.

Omae et al. teaches a nonwoven separator with a pore radius of 75 um (paragraph 0006 from English translation) for the purpose of being excellent in solution retention and absorbency (paragraph 0004).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Yen with a separator comprising a pore radius of 75um in order to be excellent in solution retention and absorbency as taught by Omae et al.

As to claim 2, Yen discloses wherein said separator is less than 35 .mu.m in Thickness (col. 3 line 67).

As to claim 3, Yen discloses wherein said polymeric fibers are selected from fibers of polyacrylonitrile, polyester, polyolefin or mixtures thereof (col. 2 line 50-56).

As to claim 4, Yen discloses wherein said polymeric fibers are from 0.1 to 10 .mu.m in diameter (col. 3 line 46-48).

As to claim 5, Yen discloses wherein said flexible nonwoven has a base weight of less than 20 g/m.sup.2 (col. 4 line 1).

As to claim 6, Yen discloses wherein said nonwoven is from 5 to 30 .mu.m in Thickness (col. 3 line 67).

As to claim 9, Yen discloses wherein said separator is from 30 to 80% in porosity (col. 2 line 67).

As to claim 10, wherein by said separator has a breaking strength of more than 1 N/cm, Yen teaches the nonwoven polyolefin separator as desired by the applicant therefore, it is inherent that the separator has a breaking strength of more than 1N/cm. .

As to claims 11-12, wherein said separator is bendable around a radius down to 100 mm without damage or around a radius down to 1 mm without damage, since Yen discloses the a nonwoven polyolefin separator as desired by the applicant it would be inherent that the separator is bendable around a radius down to 100 mm without damage or around a radius down to 1 mm without damage.

As to claim 24 wherein the use of the separator is a separator in lithium batteries is intended use. It has been held that a recitation with respect to the manner in which the claimed particle is intended to be employed does not differentiate the claimed article from a prior art article satisfying the claimed structural limitations. Ex parte Masham, 2 USPQ2d 1647 (1987)

As to claim 25, Yen discloses a battery comprising the separator discloses above (col. 1 line 11-12).

3. Claims 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yen in view of Omae et al. and in further view of Kung (5389471).

Yen discloses the separator disclosed above.



As to claim 7, Yen discloses wherein said porous inorganic coating present on and in said nonwoven comprises oxide particles of the elements Al, Si and/or Zr (col. 2 lines 50-53).

Yen fail to disclose the oxide particles having an average particle size from 0.5 to 7  $\mu\text{m}$ .

Kung teaches oxide particles having an average particle size from 0.5 to 7  $\mu\text{m}$  for the purpose of providing a separator that is excellent in tensile strength , wicking properties, wettability and alkali resistance (col. 2 lines 3-4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Yen with oxide particles having an average particle size from 0.5 to 7  $\mu\text{m}$  in order to provide a separator that is excellent in tensile strength , wicking properties, wettability and alkali resistance (col. 2 lines 3-4) as taught by Kung.

As to claim 8, Yen discloses wherein said porous inorganic coating present on and in said nonwoven, comprises aluminum oxide particles which are adhered by an oxide of the elements Zr or Si (col. 2 lines 50-53).

Yen fail to disclose the oxide particles having an average particle size from 1 to 4  $\mu\text{m}$ .

Kung teaches oxide particles having an average particle size of 1  $\mu\text{m}$  for the purpose of providing a separator that is excellent in tensile strength , wicking properties, wettability and alkali resistance (col. 2 lines 3-4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time applicant's invention was made to provide, Yen with oxide particles having an average particle size of 1  $\mu\text{m}$  in order to provide a separator that is excellent in tensile strength, wicking properties, wettability and alkali resistance (col. 2 lines 3-4) as taught by Kung.

**(10) Response to Argument**

In response to appellant's argument that Yen does not disclose a porous inorganic coating, Yen teaches inorganic fillers that are added as part of the encapsulation sheath to improve the wettability of the nonwoven thus the inorganic fillers are considered the inorganic coating because the inorganic fillers is on and in the nonwoven material as desired by appellant's claim 1. In response to appellant's argument that the inorganic fillers do not make the encapsulation sheath inorganic, the inorganic fillers itself is considered the inorganic coating.

In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Yen teaches a wettable non woven battery separator and Omae et al. teaches a nonwoven battery separator that is excellent in liquid retaining and absorbing characteristics with pore

radius of 25-100um. Therefore, it would have been obvious to one having ordinary skill in the art at the time appellant's invention was made to provide, Yen with a separator comprising a pore radius of 75-150um in order to be excellent in solution retention and absorbency as taught by Omae et al. Both Yen and Omae et al. teaches *same nonwoven separator material* for the secondary batteries, therefore, it would have been obvious to provide the same separator material with optimal pore radius taught by Omae et al. in order to provide Yen with a separator comprising optimal results. Furthermore, Yen discloses that the separator surface pore size is at least 5 microns which reads on a pore radius of 75-100um because at least 5 microns is 5 microns or more.

In response to appellant's argument that Yen does not disclose any porosity for his separator because Yen refers to the wet porosity of the cellophane material disclosed as an exemplary material for the encapsulation sheath therein, the encapsulation sheath is part of the separator just as appellant's coating is part of appellant's separator therefore the porosity of the separator is disclosed by Yen.

In response to appellant's argument that there is not basis for inherency of the breaking strength, Yen teaches the nonwoven polyolefin separator as desired by the applicant therefore, it is inherent that the separator has a breaking strength of more than 1N/cm because the same materials should have the same physical properties. In response to appellant's argument that there is no basis for the inherency of the bendable limitation, Yen discloses the a nonwoven polyolefin separator as desired by the applicant it would be inherent that the separator is bendable around a

radius down to 100 mm without damage or around a radius down to 1 mm without damage.

In response to appellant's argument that there is no suggestion to combine the references, the examiner recognizes that obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is some teaching, suggestion, or motivation to do so found either in the references themselves or in the knowledge generally available to one of ordinary skill in the art. See *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988) and *In re Jones*, 958 F.2d 347, 21 USPQ2d 1941 (Fed. Cir. 1992). In this case, Yen teaches a wettable non woven battery separator and Kung teaches a wettable nonwoven separator. Yen teaches organic fillers in the nonwoven separator and Kung teaches organic fillers in the nonwoven separator. Yen fail to teach the particle size of the organic fillers and Kung teaches oxide particles having the desired average particle size for the purpose of providing a separator that is excellent in tensile strength , wicking properties, wettability and alkali resistance (col. 2 lines 3-4). Therefore, it would have been obvious to one having ordinary skill in the art at the time appellant's invention was made to provide, Yen with oxide particles having the desired average particle size from 0.5 to 7 .mu.m in order to provide a separator that is excellent in tensile strength , wicking properties, wettability and alkali resistance (col. 2 lines 3-4) as taught by Kung. In response to appellant's argument that the fillers of particle size disclosed by Kung would not be part of a coating, the fillers disclosed by Kung is a coating on and in the separator.

In response to appellant's argument that none of the prior art discloses aluminum oxide particles of any average particle size adhered by an oxide of Zr or Si, both Kung and Yen teaches that aluminum oxide particles and Zr or Si oxide among other inorganic particles can be used as fillers.

In response to the arguments concerning the double patenting rejection wherein Omae et al. does not that the pore size disclosed have any applicability in the battery separator claimed, Omae et al. teaches same nonwoven separator material for the secondary batteries, therefore, it would have been obvious to provide the same separator material with optimal pore radius taught by Omae et al. in order to provide copending application with a separator comprising optimal results such as being excellent in liquid retaining and absorbing characteristics.

**(11) Related Proceeding(s) Appendix**

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Jane Rhee/

Primary Examiner, Art Unit 1795

Conferees:

Patrick Ryan

Application/Control Number: 10/524,143  
Art Unit: 1795

Page 12

/PATRICK RYAN/

Supervisory Patent Examiner, Art Unit 1795

William Krynski

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Quality Assurance Specialist, TC1700

DOCKET NO: 264612US0X PCT

IN THE UNITED STATES PATENT & TRADEMARK OFFICE

IN RE APPLICATION OF :  
VOLKER HENNIGE, ET AL. : EXAMINER: RHEE, J. J.  
SERIAL NO: 10/524,143 :  
FILED: FEBRUARY 11, 2005 : GROUP ART UNIT: 1795  
FOR: ELECTRIC SEPARATOR, :  
METHOD FOR MAKING SAME AND  
USE THEREOF IN HIGH-POWER  
LITHIUM CELLS

REPLY BRIEF

COMMISSIONER FOR PATENTS  
ALEXANDRIA, VIRGINIA 22313

SIR:

The following Reply Brief is in reply to the Examiner's Answer dated September 5, 2008 (Answer).

The statement of the Grounds of Rejection (Answer at 3-8) is identical in the statement in the rejection dated November 16, 2007, which has already been responded to in the Appeal Brief. In addition, in the Response to Argument (Answer at 8-11), much but not all is identical to the Response to Argument in the Final Rejection, which has also already been responded to in the Appeal Brief. The following is in reply to findings made for the first time under Response to Argument.

In response to Applicants' argument that the inorganic fillers optionally contained in the encapsulation sheath of Yen do not make the encapsulation sheath inorganic, the Examiner finds "the inorganic fillers itself is [sic] considered the inorganic coating" (Answer at 8).

In reply, a material containing a polymer and an inorganic material, even if not optional, cannot be characterized as “inorganic.”

The Examiner finds that “Yen discloses that the separator surface pore size is at least 5 microns which reads on a pore radius of 75-100 $\mu$ m because at least 5 microns is 5 microns or more” (Answer at 9).

In reply, it is not clear what is meant by “surface” pore size since the separator necessarily has a certain thickness. Nevertheless, this disclosure does not suggest a pore radius distribution in the separator in which at least 50% of the pores have a pore radius from 75 to 150  $\mu$ m.

In response to Applicants’ argument with regard to the separate patentability of Claim 9 that Yen does not disclose any porosity for his separator because Yen refers to the wet porosity of the cellophane material disclosed as an exemplary material for the encapsulation sheath therein, the Examiner finds that “the encapsulation sheath is part of the separator just as appellant’s coating is part of appellant’s separator therefore the porosity of the separator is disclosed by Yen” (Answer at 9).

In reply, Claim 9 refers to the porosity of **the** separator, not **part** of the separator.

In response to Applicants’ argument with regard to the separate patentability of Claim 10 that there is no basis for the Examiner’s finding of the presently-recited breaking strength as inherent in Yen, the Examiner finds that “Yen teaches the nonwoven polyolefin separator as desired by the applicant therefore, it is inherent that the separator has a breaking strength of more than 1N/cm because the same materials should have the same physical properties” (Answer at 9).

In reply, Applicants have already shown how the material of the presently-claimed separator is different from that of Yen. Therefore, it cannot be assumed that any of the properties of Yen’s separator are inherent in the presently-claimed separator.



In response to Applicants' argument regarding the separate patentability of Claims 11 and 12 that there is no basis for finding that the presently-recited bendable limitation is inherent in Yen, the Examiner finds that "Yen discloses the [sic] a nonwoven polyolefin separator as desired by the applicant it would be inherent that the separator is bendable around a radius down to 100 mm without damage or around a radius down to 1 mm without damage" (Answer at 9-10).

In reply, what has been stated above with regard to the Examiner's finding on Claim 10 on inherency applies herein as well.

In response to Applicants' argument that the fillers of Kung are not part of a coating but are present in the separator *per se*, the Examiner finds that "the fillers disclosed by Kung is [sic] a coating on and in the separator" (Answer at 10).

In reply, Applicants maintain the argument made in the Appeal Brief.

In response to Applicants' argument regarding the separate patentability of Claim 8 that none of the applied prior art discloses aluminum oxide particles of any average particle size, let alone that recited in the claim, adhered by an oxide of Zr or Si, the Examiner finds that "both Kung and Yen teaches [sic] that aluminum oxide particles and Zr or Si oxide among other inorganic particles can be used as fillers" (Answer at 11).

In reply, the fact that such oxides may be disclosed individually does not suggest any adherence of one type (aluminum oxide) to another type (oxide of Zr or Si).

In response to Applicants' arguments regarding the double patenting rejection, the Examiner simply repeats the Response to Argument in the Final Rejection, except that both mentions of Yen are omitted, and the second mention of Yen is replaced with "copending application." However, the Examiner has not substantively responded to Applicants' arguments in the Appeal Brief.

Application No. 10/524,143  
Reply Brief

Applicants continue to maintain that the rejection should be REVERSED.

Customer Number

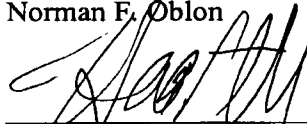
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Respectfully submitted,

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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/524,143	02/11/2005	Volker Henninge	264612US0XPCT	2418
22850	7590	02/02/2010		
OBLON, SPIVAK, MCCLELLAND MAIER & NEUSTADT, L.L.P. 1940 DUKE STREET ALEXANDRIA, VA 22314			EXAMINER RHEE, JANE J	
			ART UNIT 1795	PAPER NUMBER
			NOTIFICATION DATE 02/02/2010	DELIVERY MODE ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

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UNITED STATES PATENT AND TRADEMARK OFFICE

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BEFORE THE BOARD OF PATENT APPEALS  
AND INTERFERENCES

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*Ex parte* VOLKER HENNINGE,  
CHRISTIAN HYING, and GERHARD HORPEL

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Appeal 2009-011170  
Application 10/524,143  
Technology Center 1700

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Decided: January 29, 2010

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Before BRADLEY R. GARRIS, CHARLES F. WARREN, and  
TERRY J. OWENS, *Administrative Patent Judges*.

WARREN, *Administrative Patent Judge*.

DECISION ON APPEAL

Applicants appeal to the Board from the decision of the Primary Examiner finally rejecting claims 1-12, 24, and 25 in the Office Action mailed April 14, 2008. 35 U.S.C. §§ 6 and 134(a) (2002); 37 C.F.R. § 41.31(a) (2008).

An oral hearing was held January 21, 2010.

We reverse the decision of the Primary Examiner.

Claim 1 illustrates Appellants' invention of a separator, and is representative of the claims on appeal:

1. A separator, comprising a flexible nonwoven having a porous inorganic coating on and in said nonwoven, and wherein the material of said nonwoven is selected from nonwoven, nonelectroconductive polymeric fibers, and wherein said nonwoven has a thickness of less than 30  $\mu\text{m}$ , a porosity of more than 50% and a pore radius distribution, in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ .

The Examiner relies upon the evidence in these references (Ans. 2-3):

Kung	5389,471	Feb. 14, 1995
Yen	6,495,292 B1	Dec. 17, 2002
Omae	JP 10-326607 A	Dec. 8, 1998

Appellants request review of the following grounds of rejection advanced on appeal by the Examiner (App. Br. 2-3):

claims 1-6, 9-12, 24, and 25 under 35 U.S.C. § 103(a) over Yen in view of Omae (Ans. 4);

claims 7 and 8 under 35 U.S.C. § 103(a) over Yen in view of Omae and further in view of Kung (Ans. 6); and

claims 1-12, 24, and 25 provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-12 of co-pending Application 10/504,144<sup>1</sup> in view of Omae (Ans. 3).

### Opinion

#### Claims 1 and 7: § 103(a)

The dispositive issue entails the interpretation of the claim language “inorganic coating” of representative independent claim 1 and dependent claim 7 by giving this term the broadest reasonable interpretation in its

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<sup>1</sup> We refer to Application 10/504,144 herein as the ‘144 Application.

ordinary usage in context as it would be understood by one of ordinary skill in the art in light of the written description in the Specification. *See, e.g., In re ICON Health and Fitness, Inc.*, 496 F.3d 1374, 1378-79 (Fed. Cir. 2007); *In re Am. Acad. of Sci. Tech. Ctr.*, 367 F.3d 1359, 1364 (Fed. Cir. 2004), and cases cited therein; *In re Morris*, 127 F.3d 1048, 1054-55 (Fed. Cir. 1997).

On this record, we agree with Appellants that the claim term “inorganic coating” necessarily means that the coating must be entirely “inorganic.” App. Br., e.g., 4 and 6. We find no basis in the language of the appealed claims or in the Specification to interpret this term as including “organic” ingredients. *See Spec.*, e.g., 12-13, 15, and 16.

We further agree with Appellants that in disclosing a polymeric encapsulation sheath as a coating around the fibers of the nonwoven of the disclosed separator, Yen describes to one of ordinary skill in this art an “organic” coating on and in the nonwoven even though the polymeric encapsulation sheath can contain inorganic fillers. App. Br. 4-6. Yen, e.g., col. 1, ll. 61-67; and col. 2, ll. 25-32 and 48-56. Indeed, in view of the necessary polymeric component in Yen’s encapsulation sheath, we cannot subscribe to the Examiner’s position that “the inorganic fillers itself is considered the inorganic coating.” Ans. 8; *see* Reply Br. 1-2.

On this record, the Examiner has not adduced scientific reasoning or evidence establishing that one of ordinary skill in this art would have modified Yen’s separators by interchanging an “inorganic” coating for Yen’s “organic coating” to obtain a separator having an inorganic coating on and in a nonwoven as claimed in claims 1 and 7. We find that Omae discloses an “organic” coating. Omae ¶ 0006.

Thus, we agree with Appellants that the Examiner has not established that the combined teachings of Yen and Omae alone and as further combined with Kung provide the factual foundation for a conclusion of prima facie obviousness under § 103(a). App. Br. 6 and 8. *See, e.g., In re Oetiker*, 977 F.2d 1443, 1445 (Fed. Cir. 1992); *In re Warner*, 379 F.2d 1011, 1017 (CCPA 1967).

Accordingly, in the absence of a prima facie case of obviousness, we reverse the grounds of rejection of the appealed claims under 35 U.S.C. § 103(a).

Claim 1: Judicially Created Doctrine Of  
Obviousness-Type Double Patenting

We find representative independent claim 1 of the '144 Application specifies a “separator comprising a flexible substrate . . . having a multiplicity of openings and having a porous ceramic coating on and in said substrate,” wherein the “substrate” can be “non-woven . . . and has a porosity of more than 50%.” We determine there is no claim limitation in claim 1 of the '144 Application specifying the “nonwoven has . . . a pore radius distribution, in which at least 50% of the pores have a pore radius from 75 to 150  $\mu\text{m}$ ” as required by appealed claim 1. App. Br. 9. Indeed, the Examiner points to no disclosure in the Specification of the '144 Application which describes the pour radius distribution of a separator falling within claim 1 of the '144 Application, and we find none. *See Spec.*, e.g., 6:1 to 7:8, and 8:14-25.

On this record, we agree with Appellants that one of ordinary skill in this art would not have been led by any limitation of the “inorganic” ceramic coated separators in claims 1-12 of the '144 Application to the disclosure of

a limitation of a maximum diameter range size range for an “organic” coated separator in Omae, which organic separator has no resemblance to the claimed “inorganic” ceramic coated separator encompassed by claims 1-12 of the ‘144 Application. App. Br. 9; Omae ¶ 0006. Thus, on this record, we determine that one of ordinary skill in this art would not have arrived at the claimed “inorganic” coated separator encompassed by appealed claims 1-12, 24, and 25. The Examiner does not contend otherwise as Appellants point out. App. Br. 10; Reply Br. 3; Ans. 11.

Accordingly, in the absence of a prima facie case of provisional obviousness-type double patenting, we reverse the ground of rejection of the appealed claims under this judicially created doctrine.

The Primary Examiner’s decision is reversed.

REVERSED

kmm

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